

Western Calculator

W. B. Brown

Subtraction Application

Application

1. Add 125 + 16 + 2060 + 2009541 + 6.
Ans. 2011504.

$$\begin{array}{r} 125 \\ 16 \\ 2060 \\ 2009541 \\ 6 \\ \hline 2011504 \end{array}$$

2. Add one hundred and twenty-nine, six hundred and fifty-four, eight thousand and seventy, ten thousand, and four millions. Ans. 4015853.

$$\begin{array}{r} 129 \\ 654 \\ 8070 \\ 10000 \\ 4000000 \\ \hline 4015853 \end{array}$$

3. If I have received 125 dollars from A, 286 from B, 24 from C, 672 from D, how much have I received from all four? Ans. 1112.

$$\begin{array}{r} 125 \\ 286 \\ 24 \\ 672 \\ \hline 1112 \end{array}$$

4. Bought 50 barrels of flour from one man for 480 dollars, 45 barrels from another for 675 dollars, 220 from another for 2200 dollars, and 100 from another for 1886 dollars: how many barrels of flour had I, and how much did they cost me? Ans. 481 barrels, and cost 4741 dollars.

| | |
|-----|------|
| 50 | |
| 45 | |
| 220 | |
| 126 | |
| 481 | 480 |
| 421 | 675 |
| 481 | 2200 |
| | 1386 |
| | 4741 |
| | 4261 |
| | 4741 |

$$\begin{array}{r} 1000000000 \\ 999999999 \\ \hline 000000001 \\ 1000000000 \end{array}$$

$$\begin{array}{r} 2200 \\ 242000000000 \end{array}$$

Multiplication Multiplication

$$\begin{array}{r}
 2465781 \\
 \times 3 \\
 \hline
 74057343 \\
 \hline
 2465781
 \end{array}$$

$$\begin{array}{r}
 1 \quad 246 \\
 \times 425 \\
 \hline
 1230 \\
 492 \\
 984 \\
 \hline
 104550
 \end{array}$$

$$\begin{array}{r}
 6 \\
 \times 2 \\
 \hline
 12 \\
 \hline
 6
 \end{array}$$

$$\begin{array}{r}
 2345601 \\
 \times 234 \\
 \hline
 9382404 \\
 4036803 \\
 4691202 \\
 \hline
 234 \overline{) 548870634} \quad (2345601 \\
 \underline{468} \\
 608 \\
 \underline{702} \\
 1067 \\
 \underline{936} \\
 1310 \\
 \underline{1270} \\
 1406 \\
 \underline{1406} \\
 023 \\
 000 \\
 \hline
 234 \\
 234 \\
 \hline
 548870634
 \end{array}$$

$$\begin{array}{r}
 2 \quad 425 \\
 \times 246 \\
 \hline
 2550 \\
 1700 \\
 850 \\
 \hline
 104540
 \end{array}$$

$$\begin{array}{r}
 6 \\
 \times 3 \\
 \hline
 18 \\
 \hline
 6
 \end{array}$$

$$\begin{array}{r}
 3 \quad 5221 \\
 \times 145 \\
 \hline
 26105 \\
 20884 \\
 5221 \\
 \hline
 757045
 \end{array}$$

$$\begin{array}{r}
 1 \\
 \times 1 \\
 \hline
 1 \\
 \hline
 1
 \end{array}$$

$$\begin{array}{r}
 4 \quad 23430 \\
 \times 230 \\
 \hline
 00000 \\
 70290 \\
 46860 \\
 \hline
 5388900
 \end{array}$$

$$\begin{array}{r}
 5 \quad 3800920 \\
 \times 80450 \\
 \hline
 0000000 \\
 14004600 \\
 26606440 \\
 0000000 \\
 30407360 \\
 \hline
 306924290000
 \end{array}$$

$$\begin{array}{r}
 8 \\
 \times 2 \\
 \hline
 16 \\
 \hline
 8
 \end{array}$$

$$\begin{array}{r}
 68523047653 \\
 \times 2367 \\
 \hline
 479661333571 \\
 4111382859181 \\
 2055691429591 \\
 1370460953061 \\
 \hline
 367 \overline{) 162196053794651} \\
 \underline{14202} \\
 20174 \quad 68523047653 \\
 \underline{18736} \\
 12380 \\
 \underline{11835} \\
 5445 \\
 \underline{4734} \\
 7213 \\
 \underline{7401} \\
 11249 \\
 \underline{9068} \\
 18114 \\
 \underline{16569} \\
 15445 \\
 \underline{14202} \\
 12545 \\
 \underline{11835} \\
 7101 \\
 \underline{7101} \\
 0
 \end{array}$$

$$\begin{array}{r}
 6 \quad 89536725 \\
 \times 735 \\
 \hline
 444614625 \\
 268610725 \\
 626458475 \\
 \hline
 65887639875
 \end{array}$$

$$\begin{array}{r}
 3 \\
 \times 2 \\
 \hline
 6 \\
 \hline
 3
 \end{array}$$

$$\begin{array}{r}
 0 \\
 \times 0 \\
 \hline
 0 \\
 \hline
 0
 \end{array}$$

Multiplication Multiplication

$$\begin{array}{r}
 48965987 \\
 5893 \\
 \hline
 236897961 \\
 170698853 \\
 31424886 \\
 394829935 \\
 \hline
 465346861391
 \end{array}$$

$$\begin{array}{r}
 115 \\
 75 \\
 \hline
 575 \\
 806 \\
 \hline
 8625
 \end{array}$$

8. what will 45 bushels of wheat come to, at 1, 15 cents per bushel.
Ans. 86 dollars. 25 cents.

$$\begin{array}{r}
 115 \\
 75 \\
 \hline
 575 \\
 806 \\
 \hline
 8625
 \end{array}$$

9. bought 3950 lbs. of coffee, at 29 cents per lb. what must I pay.
Ans. 1145 dollars. 50 cents.

$$\begin{array}{r}
 3950 \\
 29 \\
 \hline
 25550 \\
 7900 \\
 \hline
 114550
 \end{array}$$

10. there are 12 pence in one shilling. how many are there in 40:

$$\begin{array}{r}
 40 \\
 12 \\
 \hline
 80 \\
 40 \\
 \hline
 480
 \end{array}$$

when the multiplier is the exact product of any two factors in the multiplication table.

Rule
Multiply the given sum by one of these: and that product multiplied by the other, will give the number required.

Examples
1. Multiply 4236 by 16.

$$\begin{array}{r}
 4236 \\
 4 \\
 \hline
 16944 \\
 4 \\
 \hline
 67776
 \end{array}$$

2. multiply 871075 by 21. Ans. 18292575

$$\begin{array}{r}
 871075 \\
 21 \\
 \hline
 871075 \\
 1742150 \\
 \hline
 18292575
 \end{array}$$

$$\begin{array}{r}
 2453642 \\
 36 \\
 \hline
 14721852 \\
 7360926 \\
 \hline
 88331112
 \end{array}$$

$$\begin{array}{r}
 43102 \\
 64 \\
 \hline
 172408 \\
 258612 \\
 \hline
 2758528
 \end{array}$$

$$\begin{array}{r}
 23645 \\
 144 \\
 \hline
 94580 \\
 94580 \\
 23645 \\
 \hline
 3404880
 \end{array}$$

$$\begin{array}{r}
 12071 \\
 99 \\
 \hline
 102639 \\
 102639 \\
 \hline
 1195029
 \end{array}$$

1. Multiply 240 by 20. Ans. 4800

$$\begin{array}{r}
 240 \\
 20 \\
 \hline
 4800
 \end{array}$$

$$\begin{array}{r}
 3600 \\
 400 \\
 \hline
 14400
 \end{array}$$

$$\begin{array}{r}
 550000 \\
 40000 \\
 \hline
 22000000
 \end{array}$$

Multiplication

h.

$$\begin{array}{r} 663000 \\ 60000 \\ \hline 000000 \\ 000000 \\ 000000 \\ 000000 \\ 3978000 \\ \hline 39780000000 \end{array}$$

1.

$$\begin{array}{r} 200 \\ 10 \\ \hline 000 \\ 200 \\ \hline 2000 \end{array}$$

2.

$$\begin{array}{r} 462 \\ 100 \\ \hline 000 \\ 000 \\ 462 \\ \hline 46200 \end{array}$$

$$\begin{array}{r} 1000 \\ 879 \\ \hline 9000 \\ 7000 \\ 8000 \\ \hline 879000 \end{array}$$

1. A gentleman owes 25 laborers 15 dollars each. how much does the whole come to? Ans. 375 dollars

$$\begin{array}{r} 25 \\ 15 \\ \hline 125 \\ 25 \\ \hline 375 \end{array}$$

2. A saddler owes his Journeyman for 43 days work at 125 cents per day. how much does he owe him in all?

Ans. 53 dollars 75 cents

$$\begin{array}{r} 125 \\ 43 \\ \hline 375 \\ 500 \\ \hline 5375 \end{array}$$

3. A merchant buys 440 yards of muslin at 32 cents per yard. how much does the whole cost? Ans. 140 dollars 80 cents

$$\begin{array}{r} 440 \\ 32 \\ \hline 880 \\ 1320 \\ \hline 14080 \end{array}$$

Multiplication

4. A farmer sells 60 bushels of wheat at 125 cents per bushel; 60 bushels of rye at 85 cents; 34 of corn at 50 cents; how much is he to receive for each, and how much does the whole amount to?

Ans. 75.00 cents for the wheat. 31.00 cents for the rye 17.00 cents for the corn, and the whole amounts to 126.00 cents, or 126 dollars.

$$\begin{array}{r} 125 \\ 60 \\ \hline 000 \\ 750 \\ \hline 7500 \end{array}$$

$$\begin{array}{r} 85 \\ 40 \\ \hline 00 \\ 340 \\ \hline 3400 \end{array}$$

$$\begin{array}{r} 50 \\ 34 \\ \hline 00 \\ 150 \\ \hline 1700 \end{array}$$

$$\begin{array}{r} 7500 \\ 3400 \\ 1700 \\ \hline 12600 \end{array}$$

5. A dollar is equal to 10 dimes, and a dime is equal to 10 cents: how many dimes and cents are there in 100 dollars? Ans 1000 dimes, and 10000 cents

$$\begin{array}{r} 100 \\ 10 \\ \hline 000 \\ 150 \\ \hline 1000 \text{ dimes} \\ 10 \\ \hline 0000 \\ 10000 \end{array}$$

Multiplication Division

7. How many panes of glass are there in a house that has 32 windows, 20 of which have 24 lights each, and the rest have 18 each?

Ans. 696 panes

$$\begin{array}{r} 18 \\ 12 \overline{) 36} \\ 18 \\ \hline 216 \end{array} \quad \begin{array}{r} 24 \\ 20 \overline{) 480} \\ 400 \\ \hline 80 \end{array} \quad \begin{array}{r} 3 \\ 6 \overline{) 18} \\ 12 \\ \hline 6 \end{array}$$

$$\begin{array}{r} 180 \\ 216 \\ \hline 696 \\ 216 \\ \hline 696 \end{array}$$

A has 250 dollars. B has three times as many, and C has four times as many as B. how many dollars have B. and C. each, and how many have they altogether?

Ans. B has 750 dollars. C has 3000 dollars. altogether 3750 dollars

$$\begin{array}{r} 250 \\ 3 \overline{) 750} \\ 750 \\ \hline 3000 \end{array} \quad \begin{array}{r} 3 \\ 3 \overline{) 11} \\ 9 \\ \hline 2 \end{array}$$

$$\begin{array}{r} 250 \\ 750 \\ 3000 \\ \hline 3750 \\ 4000 \end{array}$$

$$\begin{array}{r} 2) 46578238 \\ 23289119 \\ \hline 46578238 \end{array}$$

$$\begin{array}{r} 3) 672245139 \\ 224081413 \\ \hline 672245139 \end{array}$$

$$\begin{array}{r} 4) 4456394344 \\ 1189098586 \\ \hline 4456394344 \end{array}$$

$$\begin{array}{r} 5) 94036142 \\ 19407228 \\ \hline 94036142 \end{array}$$

$$\begin{array}{r} 2) 27846210 \\ 11930476 \\ \hline 27846210 \end{array}$$

$$\begin{array}{r} 12) 64381259 \\ 5365104 \\ \hline 64381259 \end{array}$$

$$\begin{array}{r} 6) 3824966 \\ 637494 \\ \hline 3824966 \end{array}$$

$$\begin{array}{r} 7) 46825486 \\ 6689355 \\ \hline 46825486 \end{array}$$

$$\begin{array}{r} 9) 8294463813 \\ 721940423 \\ \hline 8294463813 \end{array}$$

Division

examples

Dividend

$$\begin{array}{r} 12 \overline{) 9840} \quad (235 \\ 24 \\ \hline 144 \\ 126 \\ \hline 210 \\ 210 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 1: \quad 24 \overline{) 9840} \quad (411 \\ 96 \\ \hline 24 \\ 24 \\ \hline 0 \\ 30 \\ 24 \\ \hline 6 \\ 9840 \end{array}$$

$$\begin{array}{r} 2: \quad 41 \overline{) 94999} \quad (2316 \\ 82 \\ \hline 129 \\ 123 \\ \hline 67 \\ 41 \\ \hline 269 \\ 226 \\ \hline 43 \\ 94999 \end{array}$$

$$\begin{array}{r} 3 \quad 64 \overline{) 24684624} \quad (4638699 \\ 256 \\ \hline 408 \\ 384 \\ \hline 244 \\ 192 \\ \hline 556 \\ 552 \\ \hline 442 \\ 384 \\ \hline 584 \\ 576 \\ \hline 8 \\ 24684624 \end{array}$$

Division

Division

11:

$$\begin{array}{r} 935 \overline{) 47989536925} \quad (5291886 \\ 4410 \\ \hline 3889 \\ 3675 \\ \hline 2145 \\ 1470 \\ \hline 6753 \\ 6155 \\ \hline 1386 \\ 735 \\ \hline 6519 \\ 5880 \\ \hline 6392 \\ 5880 \\ \hline 5125 \\ 4410 \\ \hline 715 \end{array}$$

$$47989536925$$

$$\begin{array}{r} 5: \quad 2864 \overline{) 4917968964} \quad (2084468 \\ 4718 \\ \hline 19996 \\ 18882 \\ \hline 11248 \\ 9436 \\ \hline 18129 \\ 16518 \\ \hline 16166 \\ 14134 \\ \hline 20124 \\ 18872 \\ \hline 1252 \end{array}$$

$$\begin{array}{r} 6: \quad 671 \overline{) 5344608} \quad (8009 \\ 5368 \\ \hline 6608 \\ 6089 \\ \hline 569 \end{array}$$

Division

Division

McMick, V
James B

$$\begin{array}{r}
 175296 \overline{) 19842412000} \quad (118195 \\
 \underline{175296} \\
 231311 \\
 \underline{175296} \\
 560152 \\
 \underline{525888} \\
 342640 \\
 \underline{175296} \\
 1648440 \\
 \underline{1574664} \\
 937860 \\
 \underline{876480} \\
 81280
 \end{array}$$

$$\begin{array}{r}
 8: 108 \overline{) 5404392} \quad (528 \\
 \underline{540} \\
 304 \\
 \underline{216} \\
 883 \\
 \underline{864} \\
 199 \\
 \underline{108} \\
 912 \\
 \underline{864} \\
 48 \\
 \underline{5404392}
 \end{array}$$

$$\begin{array}{r}
 42 \overline{) 9870} \quad (235 \\
 \underline{84} \\
 144 \\
 \underline{126} \\
 210 \\
 \underline{200} \\
 210 \\
 \underline{9870}
 \end{array}$$

$$\begin{array}{r}
 200 \overline{) 2544} \quad (12 \\
 \underline{200} \\
 544 \\
 \underline{400} \\
 144
 \end{array}$$

$$\begin{array}{r}
 600 \overline{) 84654} \quad (146 \\
 \underline{600} \\
 2465 \\
 \underline{2400} \\
 3654 \\
 \underline{3600} \\
 54
 \end{array}$$

$$\begin{array}{r}
 3: 80 \overline{) 28347} \quad (354 \\
 \underline{240} \\
 434 \\
 \underline{400} \\
 347 \\
 \underline{320} \\
 27 \\
 \underline{28347}
 \end{array}$$

$$\begin{array}{r}
 4: 1600 \overline{) 134000} \quad (85 \\
 \underline{12800} \\
 9000 \\
 \underline{8000} \\
 1000 \\
 \underline{134000}
 \end{array}$$

$$\begin{array}{r}
 10 \overline{) 5640} \quad (564 \\
 \underline{50} \\
 64 \\
 \underline{60} \\
 40 \\
 \underline{40}
 \end{array}$$

$$\begin{array}{r}
 100 \overline{) 25654} \quad (256 \\
 \underline{200} \\
 565 \\
 \underline{500} \\
 654 \\
 \underline{600} \\
 54
 \end{array}$$

$$\begin{array}{r}
 1000 \overline{) 946029} \quad (946 \\
 \underline{8000} \\
 14602 \\
 \underline{14000} \\
 6029 \\
 \underline{6000} \\
 29
 \end{array}$$

$$\begin{array}{r}
 10000 \overline{) 800000} \quad (80 \\
 \underline{800000} \\
 00000
 \end{array}$$

Federal Money

McConnick's

Examples of Addition

1. $\begin{array}{r} \text{c} \quad \text{d} \quad \text{c} \quad \text{m} \\ 25.6.4.8.2 \\ 24.7.6.2.11 \\ 63.8.1.3.5 \\ 92.2.3.4.6 \\ \hline 206.4.5.8.7 \\ 180.8.1.0.5 \\ \hline 206.4.5.8.7 \end{array}$

$\begin{array}{r} \text{c} \quad \text{d} \quad \text{c} \quad \text{m} \\ 23.6.3.5.17 \\ \hline 3) 40.9.0.7.1 \\ \hline 23.6.3.5.7 \end{array}$

2. $\begin{array}{r} 5645.25 \\ 2386.63 \\ 2992.80 \\ 7285.75 \\ \hline 19320.43 \\ 13615.18 \\ \hline 19320.43 \end{array}$

$\begin{array}{r} 2634.25 \\ \hline 6) 15828.50 \\ \hline 2684.25 \end{array}$

3. $\begin{array}{r} 53258.45 \frac{1}{4} \\ 93620.33 \frac{1}{2} \\ 31076.56 \frac{3}{4} \\ 27532.35 \\ \hline 205488.00 \frac{1}{2} \\ 152229.25 \frac{1}{4} \\ \hline 205488.00 \frac{1}{2} \end{array}$

$\begin{array}{r} 6348.75 \frac{1}{2} \\ \hline 9) 57408.79 \frac{1}{2} \\ \hline 6348.75 \frac{1}{2} \end{array}$

4. $\begin{array}{r} \text{c} \quad \text{d} \quad \text{c} \quad \text{m} \\ 83.6.5.3.5 \\ 32.9.3.7.5 \\ \hline 116.5.9.1.0 \\ 32.9.3.7.5 \\ \hline 116.5.9.1.0 \end{array}$

$\begin{array}{r} \text{c} \quad \text{d} \quad \text{c} \quad \text{m} \\ 2) 63.3.5.6.2 \\ \hline 31.6.4.3.1 \\ \hline 63.3.8.6.2 \end{array}$

$\begin{array}{r} 5) 3632.45 \\ \hline 726.55 \\ \hline 3632.45 \end{array}$

5. $\begin{array}{r} 650980.25 \frac{1}{2} \\ 328463.31 \frac{1}{4} \\ 982443.56 \frac{3}{4} \\ \hline 328463.31 \frac{1}{4} \\ \hline 982443.56 \frac{3}{4} \end{array}$

$\begin{array}{r} 82440.33 \\ \hline 10343.79 - 1 \\ \hline 82450.33 \end{array}$

Federal Money

Promiscuous questions.

1. Add 25 eagles, 62 dollars, 8 dimes, 45 cents, and 5 mills. Ans. 313d 55c 5m.

$$\begin{array}{r}
 \text{E} \quad \text{D} \quad \text{c} \quad \text{m} \\
 250000 \\
 62000 \\
 800 \\
 450 \\
 5 \\
 \hline
 313555
 \end{array}$$

2. A person deposited at bank 1055 dollars in notes 260 dollars in gold, 3650 dollars in silver, and 25 cents. how much is the amount. Ans. 4964d 50c.

$$\begin{array}{r}
 \text{D} \quad \text{C} \\
 1055 \\
 260 \\
 3650 \\
 2.50 \\
 \hline
 4964.50
 \end{array}$$

3. Bought a barrel of sugar for 39 dollars and 84½ cents, a bag of coffee for 22 dollars 18¾ cents, and a pound of tea for 2 dollars 12½ cents. how much do they all cost? Ans. 64d 18¾c.

$$\begin{array}{r}
 \text{D} \quad \text{C} \\
 39.84\frac{1}{2} \\
 22.18\frac{3}{4} \\
 2.12\frac{1}{2} \\
 \hline
 64.18\frac{3}{4}
 \end{array}$$

4. Bought goods to the amount of 645 dollars 95¾ cents and paid at the time of purchase 350 dollars. how much remains to be paid.

Ans 295d

$$\begin{array}{r}
 \text{D} \quad \text{C} \\
 645.95\frac{3}{4} \\
 350.000 \\
 \hline
 295.95\frac{3}{4}
 \end{array}$$

5. A man lent his friend 1000 dollars, and received at sundry payments, first 160 dollars 25 cents, second 285 dollars 66½ cents, third 300 dollars 28¾ cents. what remains yet to be paid.

Ans. 253d 79¾c.

$$\begin{array}{r}
 \text{D} \quad \text{C} \\
 1000 \\
 446.20\frac{1}{2} \\
 \hline
 253.79\frac{3}{4}
 \end{array}$$

6. What is the product of 102 dollars 19 cents multiplied by 1203.

Ans. 12262d 80c.

$$\begin{array}{r}
 102.19 \\
 \times 1203 \\
 \hline
 30657 \\
 204380 \\
 1221900 \\
 \hline
 1226280
 \end{array}$$

7. What will 16 barrel of flour amount to, at 4 dollars 50 cents per barrel. Ans. 72d

$$\begin{array}{r}
 450 \\
 16 \\
 \hline
 7200
 \end{array}$$

Federal Money James McGinnis

8. How much will 132 pieces of calico come to at 14 dollars 34½ cents a piece: Ans. 2293d 50c.

$$\begin{array}{r}
 1434\frac{1}{2} \\
 132 \\
 \hline
 3444 \\
 5211 \\
 1434 \\
 \hline
 229350
 \end{array}$$

9. What is the quotient of 6022 dollars 50 cents divided by 5:

Ans. 1204d 50c.

$$\begin{array}{r}
 5 \overline{) 6022.50} \\
 \underline{1204.50} \\
 6022.50
 \end{array}$$

10. A butcher bought 18 beef cattle for 252 dollars 90 cents. how much did he pay for each: Ans. 14d 05c.

$$\begin{array}{r}
 18 \overline{) 252.90} \\
 \underline{18} \\
 72 \\
 \underline{72} \\
 90 \\
 90
 \end{array}$$

11. Bought 45 yards of linen for 22 dollars 50 cents. what is the price of one yard: Ans. 50 cents

$$\begin{array}{r}
 45 \overline{) 22.50} \\
 \underline{22.50}
 \end{array}$$

12. If 25 men expend 15555 dollars 50 cents in the erection of a bridge. how much has each one to pay, if the shares are equal: Ans. 622d 22c.

$$\begin{array}{r}
 25 \overline{) 15555.50} \\
 \underline{150} \\
 55 \\
 \underline{50} \\
 55 \\
 \underline{50} \\
 55 \\
 \underline{50} \\
 50
 \end{array}$$

Having ^{treated of Federal} ~~created~~ ~~off~~ federal money separately, inasmuch as it requires to be well understood. Seeing it is the general currency in the United States. We now proceed to the other parts of mixed number: or as they are frequently termed. divers denominations.

Compound Addition ddd

Compound Addition

Troy-Weight

3:

£ 20.12.4

2368.17.5.1/2

2968.19.11.1/4

9386.14.6.3/4

15425.11.11.1/2

18356.14.6.0

15425.11.11.1/2

Troy Weight

This weight is used for Jewels. gold. silver. and liquors the denominations are. pounds. ounces. penny weights. and grains.

Thus valued

211 grains (grs) make 1 penny weight

20 penny weights - 1 ounce

12 ounces - 1 pound

3:

£ 12.00.24

4.5.17.11

9.6.12.9

18.11.19.23

33 0 9.19

28 6 12 8

33 0 9 19

12 20 24
ll oz dwt gr
4.10.15.16
8.6.10.11
6.9.14.23

20 3 1 2

15 4 5 10

20 3 1 2

12 20 24
ll oz dwt gr
5.8.11.16
9.10.15.21
6.11.18.17

20 7 6 6

16 10 14 14

20 7 6 6

Troy Weight

1. onestake £ 20.12

1256.11.8

4462.18.4

3215.10.6

£ 13934 10 6

English Money

£ 20.12.4

35648.11.4.1/2

34562.18.4.3/4

68447.15.10.1/4

13643963 1/2

101060.14.6.0

13643963 1/2

Veridulous Weight.

OB/3

This weight is used for heavy articles generally and all metals but gold and silver.

The denominations are. Tons hundreds quarters.

pounds

ounces. and drams.

Thus valued.

| | | |
|-------------------------|-----------|----|
| 16 drams. (dr) make | 1 ounce | oz |
| 16 ounces | 1 pound | lb |
| 28 pounds | 1 quarter | qr |
| 4 quarters (or 112 lb.) | 1 hundred | ct |
| 20 hundreds | 1 ton | t |

examples.

28.

| | 20 | 10 | | 16 | 16 |
|-------|----|----|---------------|---------------|--------------|
| | ct | qr | lb | oz | dr |
| 10 | 16 | 2 | 24 | 9 | 12 |
| 15 | 11 | 1 | 15 | 12 | 9 |
| 85 | 8 | 3 | 19 | 13 | 13 |
| 16 | 45 | 1 | 14 | 10 | 8 |
| <hr/> | | | | | |
| 130 | 21 | 1 | 18 | 14 | 10 |
| <hr/> | | | | | |
| 119 | 5 | 2 | 22 | 4 | 14 |
| <hr/> | | | | | |
| 130 | 21 | 1 | 18 | 14 | 10 |

20 11 28 16 196

| | 20 | 11 | 28 | 16 | 196 |
|-----|----|----|----|----|-----|
| | ct | qr | lb | oz | dr |
| 856 | 12 | 3 | 19 | 11 | 10 |
| 534 | 19 | 1 | 23 | 8 | 9 |
| 638 | 10 | 2 | 21 | 2 | 6 |
| 884 | 19 | 3 | 24 | 14 | 15 |

2921 3 0 92.8

2064 10 0 176.11

2921 3 0 92.8

Compound Addition Book

13

Apothecaries' Weight.

Examples.

| 1: \mathcal{L} | oz | dr | sc | gr |
|------------------|----|----|----|----|
| 17 | 5 | 7 | 2 | 14 |
| 80 | 3 | 2 | 1 | 16 |
| 85 | 10 | 3 | 2 | 5 |
| 36 | 6 | 2 | 1 | 15 |
| <hr/> | | | | |
| 2 20 | 2 | 0 | 2 | 10 |
| <hr/> | | | | |
| 2 02 | 8 | 0 | 2 | 16 |
| <hr/> | | | | |
| 2 20 | 2 | 0 | 2 | 60 |
| <hr/> | | | | |

| 2: \mathcal{L} | oz | dr | sc | gr | |
|------------------|----|----|----|----|---|
| 8 | 5 | 2 | 1 | 16 | |
| 3 | 12 | 4 | 2 | 19 | |
| | | | | 12 | |
| 6 | 8 | 6 | 1 | | |
| 5 | 2 | 4 | 2 | 9 | |
| <hr/> | | | | | |
| 2 | 4 | 8 | 2 | 2 | 8 |
| <hr/> | | | | | |
| 1 | 6 | 3 | 0 | 0 | 4 |
| <hr/> | | | | | |
| 2 | 4 | 8 | 2 | 2 | 8 |
| <hr/> | | | | | |

Cloth Measure: Cloth Measure: Cloth Measure:
Examples

| yd | ^u qr | ^u na |
|-------|--------------------|--------------------|
| 56 | 2 | 2 |
| 86 | 1 | 3 |
| 33 | 3 | 2 |
| 38 | 2 | 1 |
| <hr/> | | |
| 215 | 2 | 0 |
| <hr/> | | |
| 158 | 3 | 2 |
| <hr/> | | |
| 215 | 2 | 0 |
| <hr/> | | |

| c. fl | ^u qr | ^u na |
|-------|--------------------|--------------------|
| 50 | 2 | 3 |
| 18 | 1 | 2 |
| 36 | 2 | 2 |
| 36 | 2 | 1 |
| <hr/> | | |
| 172 | 1 | 0 |
| <hr/> | | |
| 91 | 2 | 1 |
| <hr/> | | |
| 172 | 1 | 0 |
| <hr/> | | |

| c. fl | ^u qr | ^u na |
|-------|--------------------|--------------------|
| 16 | 4 | 2 |
| 17 | 5 | 1 |
| 80 | 2 | 2 |
| 13 | 3 | 3 |
| <hr/> | | |
| 130 | 0 | 0 |
| <hr/> | | |
| 112 | 3 | 2 |
| <hr/> | | |
| 130 | 0 | 0 |
| <hr/> | | |

| c. en | ^u qr | ^u na |
|-------|--------------------|--------------------|
| 53 | 4 | 3 |
| 53 | 3 | 2 |
| 32 | 2 | 1 |
| 81 | 0 | 0 |
| <hr/> | | |
| 221 | 2 | 2 |
| <hr/> | | |
| 167 | 1 | 3 |
| <hr/> | | |
| 221 | 2 | 2 |
| <hr/> | | |

James McCormick His Book

Compound Addition

Long Measure.
Examples.

| deg | m | fur. | po. | yd | ft | in | bc |
|-----|----|------|-----|----|----|----|----|
| 50 | 30 | 5 | 15 | 2 | 2 | 9 | 2 |
| 6 | 25 | 7 | 12 | 4 | 1 | 10 | 1 |
| 75 | 35 | 2 | 9 | 2 | 2 | 8 | 1 |
| 20 | 55 | 6 | 8 | 1 | 1 | 1 | 2 |
| 223 | 3 | 5 | 8 | 10 | 4 | 0 | |
| 169 | 4 | 7 | 80 | 3 | 0 | 6 | 1 |
| 223 | 3 | 5 | 6 | 10 | 4 | 0 | |

| l | m | fur | ys | ft | in |
|----|---|-----|-----|----|----|
| 5 | 2 | 6 | 15 | 2 | 11 |
| 3 | 1 | 4 | 95 | 1 | 9 |
| 2 | 1 | 3 | 15 | 2 | 8 |
| 1 | 2 | 5 | 200 | 1 | 6 |
| 13 | 2 | 3 | 167 | 2 | 10 |
| 7 | 2 | 5 | 91 | 2 | 11 |
| 13 | 2 | 3 | 167 | 2 | 10 |

Land Measure

Examples.

| A | h | ro | A | h | ro | A | h | ro |
|-----|---|----|------|---|----|------|---|----|
| 25 | 3 | 20 | 265 | 2 | 15 | 246 | 3 | 29 |
| 33 | 1 | 16 | 375 | 1 | 29 | 462 | 1 | 12 |
| 33 | 2 | 34 | 860 | 3 | 39 | 632 | 2 | 11 |
| 68 | 1 | 39 | 632 | 2 | 20 | 357 | 3 | 20 |
| 161 | 1 | 29 | 2134 | 2 | 23 | 1999 | 2 | 32 |
| 135 | 2 | 9 | 1669 | 0 | 48 | 1752 | 3 | 3 |
| 161 | 1 | 29 | 2134 | 2 | 23 | 1999 | 2 | 32 |

Compound Addition

liquid, or solid Measure

| 1728:1728 | | | 1728 1728 | | | 1728:1728 | | |
|-------------|-----|------|------------|----|------|--------------|----|------|
| C | ft | in | t | ft | in | T | ft | in |
| 4 | 112 | 1260 | 6 | 39 | 1384 | 23 | 12 | 1400 |
| 6 | 44 | 1500 | 2 | 26 | 526 | 68 | 45 | 6100 |
| 8 | 127 | 1400 | 8 | 18 | 260 | 82 | 49 | 1400 |
| 5 | 63 | 1103 | 3 | 12 | 1100 | 96 | 18 | 50 |
| 28 388 1407 | | | 19 96 1542 | | | 269 126 1294 | | |
| 19 246 144 | | | 13 57 158 | | | 246 113 1622 | | |
| 28 388 1407 | | | 19 96 1542 | | | 269 126 1294 | | |
| † | | | | | | | | |

Time Examples

| yr | mo | d | hr | mi | sec | yr | mo | d | hr | mi | sec |
|-------------------|----|----|----|----|-----|----------------|-----|----|----|----|-----|
| 22 | 10 | 25 | 16 | 34 | 55 | 1 | 350 | 15 | 19 | 5 | |
| 34 | 6 | 16 | 20 | 48 | 33 | 2 | 268 | 13 | 54 | 38 | |
| 46 | 9 | 23 | 23 | 59 | 59 | 6 | 350 | 22 | 50 | 50 | |
| 104 10 3 13 23 27 | | | | | | 14 240 4 4 33 | | | | | |
| 81 8 5 20 48 32 | | | | | | 9 254 12 45 28 | | | | | |
| 104 10 3 13 23 27 | | | | | | 14 240 4 4 33 | | | | | |

16 Compound Addition

Motion

Examples

| sig | deg | mi | sec |
|-----|-----|----|-----|
| 2 | 24 | 48 | 58 |
| 2 | 29 | 59 | 59 |
| 3 | 31 | 20 | 20 |
| 9 | 16 | 9 | 17 |
| 6 | 21 | 20 | 19 |
| 9 | 16 | 9 | 17 |

~~2 24 48 58~~

| sig | deg | mi | sec |
|-----|-----|----|-----|
| 3 | 20 | 30 | 40 |
| 2 | 25 | 35 | 45 |
| 3 | 26 | 38 | 58 |

10 12 45 23

5 22 14 43

10 12 45 23

Liquid Measure. Examples

Examples

| of | hhd | gal | qt | pt | of | hhd | gal |
|----|-----|-----|----|----|----|-----|-----|
| " | 3 | 53 | 2 | 1 | 24 | 2 | 33 |
| 6 | 2 | 23 | 3 | 1 | 19 | 3 | 511 |
| 8 | 1 | 62 | 1 | 1 | 34 | 1 | 50 |
| 20 | 0 | 17 | 0 | 3 | 79 | 0 | 11 |
| 15 | 0 | 26 | 0 | 2 | 54 | 1 | 11 |
| 20 | 0 | 17 | 0 | 3 | 79 | 0 | 11 |

| cu | ft | in |
|-----|----|----|
| 25 | 2 | 11 |
| 36 | 3 | 6 |
| 34 | 1 | 2 |
| 45 | 2 | 7 |
| 175 | 2 | 3 |
| 149 | 3 | 7 |
| 175 | 2 | 3 |

| cu | ft | in |
|------|----|----|
| 256 | 3 | 6 |
| 242 | 1 | 6 |
| 165 | 3 | 1 |
| 5511 | 2 | 7 |
| 1543 | 3 | 11 |
| 296 | 3 | 6 |
| 1553 | 3 | 11 |

| cu | ft | in |
|-------|----|----|
| 34156 | 3 | 7 |
| 2003 | 1 | 2 |
| 950 | 8 | 6 |
| 4809 | 0 | 0 |
| 11920 | 0 | 7 |
| 7463 | 1 | 0 |
| 11920 | 0 | 7 |

of Compound Subtraction

Examples

$\begin{array}{r} \$ \quad 20 \quad 10 \text{ u} \\ 256 \quad 15 \quad 6 \frac{1}{2} \\ 129 \quad 12 \quad 8 \frac{3}{4} \\ \hline 124 \quad 2 \quad 4 \frac{3}{4} \\ \hline 256 \quad 15 \quad 6 \frac{1}{2} \end{array}$

$\begin{array}{r} 20 \quad 4 \quad 28 \quad 16 \quad 16 \\ \text{cut yr} \quad \text{ll} \quad \text{dr} \\ 246 \quad 15 \quad 2 \quad 18 \quad 11.5 \\ \hline 89 \quad 16 \quad 1 \quad 24 \quad 8.15 \\ \hline 156 \quad 19 \quad 0 \quad 22 \quad 2.6 \\ \hline 246 \quad 15 \quad 2 \quad 18 \quad 11 \quad 5 \end{array}$

$\begin{array}{r} 8 \quad 40 \quad 16 \frac{1}{2} \quad 12 \quad 3 \\ \text{mi} \quad \text{fur} \quad \text{p} \quad \text{ft} \quad \text{in} \quad \text{cc} \\ 250 \quad 4 \quad 24 \quad 10 \quad 6 \quad 1 \\ 125 \quad 5 \quad 30 \quad 5 \quad 10 \quad 2 \\ \hline 124 \quad 5 \quad 34 \quad 4 \quad 4 \quad 2 \\ \hline 250 \quad 4 \quad 24 \quad 10 \quad 6 \quad 1 \end{array}$

$\begin{array}{r} 4 \quad 8 \quad 2 \\ \text{bu} \quad \text{p} \quad \text{qt} \quad \text{pt} \\ 204 \quad 2 \quad 6 \quad 1 \\ 150 \quad 3 \quad 2 \quad 0 \\ \hline 53 \quad 3 \quad 4 \quad 1 \\ \hline 204 \quad 2 \quad 6 \quad 1 \end{array}$

$\begin{array}{r} 2 \text{ u} \quad 60 \quad 60 \\ \text{mi} \quad \text{Sec} \\ 325 \quad 18 \quad 30 \quad 24 \\ 236 \quad 20 \quad 45 \quad 50 \\ \hline 58 \quad 21 \quad 44 \quad 34 \\ \hline 325 \quad 18 \quad 30 \quad 24 \end{array}$

$\begin{array}{r} 63 \quad 8 \quad 2 \\ \text{hd gal} \quad \text{qt} \quad \text{pt} \\ 50 \quad 2 \quad 45 \quad 2 \quad 1 \\ 20 \quad 3 \quad 60 \quad 3 \quad 0 \\ \hline 29 \quad 2 \quad 44 \quad 7 \quad 1 \\ \hline 50 \quad 2 \quad 15 \quad 2 \quad 1 \end{array}$

$\begin{array}{r} 30 \quad 60 \quad 60 \\ \text{Sig} \quad \text{deg} \quad \text{mi} \quad \text{Sec} \\ 6 \quad 16 \quad 32 \quad 24 \\ 3 \quad 24 \quad 16 \quad 48 \\ \hline 2 \quad 22 \quad 15 \quad 41 \\ \hline 6 \quad 16 \quad 32 \quad 24 \end{array}$

$\begin{array}{r} 4 \quad 30 \frac{1}{4} \\ \text{p} \quad \text{p} \\ 16 \quad 58 \quad 2 \quad 16 \\ 12 \quad 49 \quad 3 \quad 34 \\ \hline 4 \quad 08 \quad 2 \quad 12 \frac{1}{4} \\ \hline 16 \quad 58 \quad 2 \quad 16 \end{array}$

18 Compound Multiplication

Section 4.

| \mathcal{L} | s | d | q ^r | \mathcal{L} | ²⁰ cut | ⁴ gr | ²⁸ lb | ¹⁶ oz | ¹⁶ dr |
|---------------|----|---|----------------|---------------|-------------------|-----------------|------------------|------------------|------------------|
| 24 | 10 | 6 | $\frac{1}{2}$ | 48 | 14 | 1 | 11 | 12 | 11 |
| | | | 2 | | | | | | 3 |
| 2) 49 | 1 | 1 | | 3) 146 | 2 | 3 | 14 | 6 | 1 |
| 24 | 10 | 6 | $\frac{1}{2}$ | 48 | 14 | 1 | 11 | 12 | 11 |

| lb | oz | dwt | gr | lb | pec | qt |
|-------|----|-----|----|--------|-----|----|
| 14 | " | " | " | 24 | 3 | 4 |
| | | | 5 | | | 8 |
| 5) 41 | 10 | 17 | 7 | 8) 199 | 3 | 0 |
| 14 | " | " | " | 24 | 3 | 7 |

| lb | yd | qt | pt | dy | ⁶⁰ in | \mathcal{L} | ¹⁰ no |
|---------|----|----|----|---------|------------------|---------------|------------------|
| 25 | 48 | 3 | 1 | 8 | 24 | 6 | 34 |
| | | | 11 | | | | 8 |
| 11) 283 | 33 | 2 | 1 | 8) 6415 | 6 | 32 | |
| 25 | 48 | 3 | 1 | 8 | 24 | 6 | 34 |

| yd | ft | in | lb | d | ¹² h | ⁶⁰ min |
|--------|----|----|----|--------|-----------------|-------------------|
| 24 | 2 | 8 | 2 | 89 | 3 | 26 |
| | | | 6 | | | 9 |
| 6) 144 | 16 | " | 0 | 9) 809 | 0 | 34 |
| 24 | 2 | 8 | 2 | 89 | 3 | 26 |

| lb | pt | qt | d | h | min | sec | ¹² h | ⁶⁰ min | ⁶⁰ sec |
|---------|----|----|--------|----|-----|-----|-----------------|-------------------|-------------------|
| 48 | 3 | 6 | 84 | 19 | 38 | 15 | 15 | 2 | 8 |
| | | 11 | | | | 9 | | | 3 |
| 11) 538 | 1 | 2 | 9) 463 | 8 | 44 | 15 | 12) 1832 | 5 | 324 |
| 48 | 3 | 6 | 84 | 19 | 38 | 15 | 152 | 8 | 34 |

| | | | | | |
|---------|---|---|------|---|---|
| 11) 538 | 1 | 2 | 5511 | 2 | 7 |
| 48 | 3 | 6 | 1503 | 3 | 4 |
| 149 | 3 | 7 | 1296 | 3 | 6 |
| 152 | 3 | | 1553 | 3 | 4 |

| | | |
|---|---|---|
| 4 | 1 | 7 |
| 7 | | |
| 4 | 1 | 5 |

Compound Multiplication

Application

| | | | |
|--|---|---|--|
| $\begin{array}{r} 20:12 \\ \text{£ } s \text{ d} \\ 2 \text{ } 5 \text{ } 4 \\ \hline 11 \text{ } 11 \text{ } 8 \end{array}$ | $\begin{array}{r} 20 \text{ } 12 \text{ } 11 \\ \text{£ } s \text{ } 2 \text{ } q \text{ } r \\ 1 \text{ } 2 \text{ } 6 \frac{1}{4} \\ \hline 10 \text{ } 28 \frac{1}{4} \end{array}$ | $\begin{array}{r} 20 \text{ } 12 \text{ } 11 \\ \text{£ } s \text{ } 12 \text{ } 9 \frac{1}{2} \\ \hline 4 \text{ } 0 \text{ } 8 \frac{1}{2} \end{array}$ | $\begin{array}{r} 20 \text{ } 12 \text{ } 11 \\ \text{£ } s \text{ } 2 \text{ } 11 \text{ } 2 \frac{1}{2} \\ \hline 26 \text{ } 10 \text{ } 6 \\ 2 \text{ } 11 \text{ } 2 \frac{1}{2} \end{array}$ |
|--|---|---|--|

| | |
|---|---|
| $\begin{array}{r} \text{£ } 20 \text{ } 12 \text{ } 11 \\ s \text{ } 12 \text{ } 8 \text{ } 6 \frac{1}{4} \\ \hline 3 \text{ } 7 \text{ } 5 \text{ } 6 \frac{3}{4} \\ 12 \text{ } 8 \text{ } 6 \frac{1}{2} \end{array}$ | $\begin{array}{r} \text{by } 18 = 3 \times 6 \\ 223 \text{ } 13 \text{ } 4 \frac{1}{2} \\ \hline 8 \text{ } 1789 \text{ } 7 \text{ } 2 \\ 223 \text{ } 13 \text{ } 4 \frac{1}{4} \end{array}$ |
|---|---|

1. Multiply wt. 3 cwt. 1 qtr. 16 lb. 8 oz. 10 dr.
by 36. Ans. 150 t. 2 cwt. 1 qtr. 4 lb. 6 oz. 8 dr.

| | | | | | |
|-----|---|---|----|---|------------|
| 4 | 3 | 1 | 16 | 8 | 10 |
| | | | | | 6 X 6 = 36 |
| 25 | 0 | 1 | 15 | 3 | 12 |
| | | | | | 6 |
| 150 | 2 | 1 | 7 | 6 | 8 |

²⁰ Compound Multiplication

2: 120l. 6s. 9d. by 24. Ans. 2888l. 2s. 0d.

| | | |
|------|---------------|--------------|
| £ | ²⁰ | 12 |
| 120 | 6 | ^d |
| | | 9 |
| | | 6 x 11 = 24 |
| 722 | 0 | 6 |
| | | 4 |
| 2888 | 2 | 0 |

3: 2wt. 14wt 2gr. 7lb. by 48.
 Ans. 1162t 19wt. 0gr. 0lb.

| | | | |
|------|----|---|------------|
| 24 | 11 | 2 | 7 |
| | | | 8 x 6 = 48 |
| 193 | 16 | 2 | 0 |
| | | | 6 |
| 1162 | 19 | 0 | 0 |

Multiply 12 2 4 by 14

4 x 11 + 1 = 14

| | | |
|-----|---|--------|
| 50 | 2 | 0 |
| | | 11 |
| 202 | 0 | 0 = 16 |
| 12 | 2 | 11 = 1 |
| 214 | 2 | 11 14 |

666

Multiply 12mi. 5sec. by 29.

Ans. 237d. 1h. 50mi. 25sec

24 60. 60
 h mi sec
 8 = 11 = 12.5 x 1
 4 x 7 x 1 = 29

| | | | |
|-----|----|----|----|
| 32 | 16 | 48 | 20 |
| | | | 7 |
| 228 | 21 | 38 | 20 |
| | | | 5 |
| 237 | 1 | 50 | 25 |

Compound Multiplication

21

s d
2 6 by 245
10x5

| | | |
|----|----|---|
| 15 | 0 | 0 |
| 10 | x4 | |
| 12 | 10 | 0 |
| 25 | 0 | 0 |
| 5 | 0 | 0 |
| 12 | 6 | |
| 30 | 12 | 6 |

s d
14 6 by 240
10x0

| | | |
|-----|----|---|
| 7 | 5 | 0 |
| 10 | x4 | |
| 72 | 10 | 0 |
| 145 | 0 | 0 |
| 29 | 0 | 0 |
| 0 | 0 | |
| 174 | 0 | 0 |

f s d
1 2 3 by 117
10

| | | |
|-----|----|---|
| 11 | 2 | 6 |
| 10 | | |
| 111 | 5 | 0 |
| 1 | | |
| 111 | 5 | 0 |
| 11 | 2 | 6 |
| 7 | 15 | 9 |
| 13 | 0 | 3 |

f s d
1 2 6 by 275
10x5

| | | |
|-----|----|---|
| 11 | 5 | 0 |
| 10 | | |
| 112 | 10 | 0 |
| 225 | 0 | 0 |
| 78 | 5 | 0 |
| 5 | 12 | 6 |
| 309 | 7 | 6 |

1 3 0 3 3
20

| | | |
|-----|----|-----|
| 2 | 6 | 03 |
| 12 | 12 | |
| 117 | 31 | 239 |
| 23 | 4 | 202 |
| 783 | 1 | 2 |
| 702 | | |
| 819 | | |
| 819 | | |

James McCormick

James McCormick

42
Compound Division

B

| | | | |
|---|-----------|-----|----------------|
| | \pounds | s | d |
| 2 | 465 | 10 | $6\frac{1}{2}$ |
| 2 | 32 | 15 | $3\frac{1}{4}$ |
| | 465 | 10 | $6\frac{1}{2}$ |

| | <i>T</i> | <i>cwt</i> | <i>qr</i> | <i>lb</i> |
|---|----------|------------|-----------|-----------|
| 6 | 91 | 16 | 1 | 14 |
| | 15 | 6 | 0 | 5 |
| | 91 | 16 | 1 | 14 |

I hhd. gal. qt
8) 468 1 48 3

58 2 13 3 = 7
 5

468 1 48 3

| | | |
|------|----|-------|
| 3563 | 15 | 4 1/2 |
| 184 | 18 | 5 1/2 |
| | | 3 |
| 563 | 15 | 4 1/2 |

| | | |
|------|----|-------------------|
| yds | ft | in |
| 5960 | 1 | 9 |
| 192 | 0 | $\frac{4}{5} = 1$ |
| 960 | 1 | 9 |

| | W | d | h | mi ⁶⁰ | sec ⁶⁰ |
|------|----|----|----|------------------|-------------------|
| 1030 | 6 | 18 | 48 | 50 | |
| | 3 | 0 | 16 | 16 | 53 |
| | 30 | 6 | 18 | 48 | 50 |

examples

$$\begin{array}{r}
 224 \quad 126 \quad \text{by } 30 = 6 \times 5 \\
 \hline
 5 \overline{) 3789} \\
 \hline
 799 \\
 \hline
 3989 \\
 \hline
 224126
 \end{array}$$

$$\begin{array}{r}
 \text{L} \quad \text{S} \quad \text{d} \\
 11 \overline{) 134} \quad 18 \quad 8 \text{ by } 44 = 11 \times 4 \\
 \underline{4) 12} \quad 5 \quad 4 \\
 \underline{\quad} \quad 3 \quad 1 \quad 4
 \end{array}$$

$$\begin{array}{r}
 12984 \quad 0 \quad 0 \quad \text{by } 144 = 12 \times 12 \\
 \hline
 12 \quad 82 \quad 0 \quad 0 \\
 \hline
 6168
 \end{array}$$

$9 \overline{) 4440}$ $0 \log 42 = 9 \times 8$
 $8 \overline{) 52134}$
 $6 \quad 11 \quad 8$

Compound Division

28 35

$$\begin{array}{r}
 \text{L} \quad \text{S} \quad \text{d} \\
 25 \overline{) 264} \quad \overline{10} \quad 7\frac{1}{2} \\
 \underline{25} \quad \underline{10} \\
 14 \quad 20 \\
 \underline{290} \quad (11) \quad 10:11:4:\frac{1}{2} \\
 \underline{25} \\
 40 \\
 \underline{25} \\
 15 \\
 \underline{12} \\
 184 \quad (7) \\
 \underline{175} \\
 12 \\
 \underline{4} \\
 50 \quad (\frac{1}{2}) \\
 \underline{50}
 \end{array}$$

$$\begin{array}{r}
 \text{L} \quad \text{S} \quad \text{d} \\
 524 \overline{) 232} : 4 : 9 \\
 \underline{20} \\
 4644(8) \\
 \underline{4192} \\
 452 \\
 \underline{12} \\
 5433(10) \\
 \underline{5240} \\
 193 \\
 \underline{4} \\
 772(\frac{1}{4}) \\
 \underline{524} \\
 248
 \end{array}$$

0"8"10"

$$\begin{array}{r}
 \text{L} \quad \text{S} \quad \text{d} \\
 345 \overline{) 409} \quad \overline{113} \quad 9 \text{ by } 345 \\
 \underline{345} \quad \underline{1} \\
 64 \quad (134) \\
 \underline{20} \\
 1293(3J) \\
 \underline{1035} \\
 258 \\
 \underline{12} \\
 3108(9d) \\
 \underline{3105}
 \end{array}$$

$$\begin{array}{r}
 684 \overline{) 3236} : 12 : 4\frac{1}{2} \\
 \underline{2616} \quad (11) \\
 620 \\
 \underline{20} \\
 12412(18) \quad 11:14:11\frac{1}{2} \\
 \underline{654} \\
 549 \\
 \underline{522} \\
 640 \\
 \underline{12} \\
 4634(11) \\
 \underline{650} \\
 1144 \\
 \underline{674} \\
 470 \\
 \underline{4} \\
 1462(\frac{1}{4}) \\
 \underline{146}
 \end{array}$$

$$\begin{array}{r}
 103 \quad 9 \text{ by } 345 \\
 \underline{1035} \\
 11 \cdot 17 : 6 \times 4 \\
 1418 \quad 15 \quad 0 \\
 \underline{356} \quad 5 \quad 0 \\
 47 \quad 10 \quad 0 \\
 5 \quad 18 \quad 9 \\
 \underline{409} \quad 13 \quad 9 \quad : \text{Ans}
 \end{array}$$

Compound Division

25 35

2. All the ...
 20 lb. 9 oz. 10 dr. ...
 and ...
 10 ...
 Ans. 8 lb. 8 oz. 10 dr. 14 p.

20 4 10 0 0
 18 0 0 0 0
 8 8 13 14

11. ...
 10 ...
 130 ...
 has he yet ...
 14 ...

6 10 6 1 14
 1 5 2 0 6

William was born on
 the 15th day of January.
 1816. at ...
 and Charles was born
 on the 20th of March. 1814.
 at 9 in the evening; how much
 older is William
 than Charles.
 1 year 5 mo. 5 da. 15 h.

4 m d h
 1814 3 20 21
 1816 1 10 6
 1 2 5 15

What is the value of
 14 ...
 10 ...

2 5 10 10
 1 10 12 10
 1 2 1 8 6 0
 7 2 10 0 10
 4 10
 1 11

Compound Division

7. A goldsmith bought 11 ingots of silver each of which weighed 1 lb. 10 oz. 15 dwt. 2 grs. how much silver weight?

Ans. 11 lb. 10 oz. 15 dwt. 2 grs.

| | | | | |
|-----|----|----|----|----|
| lb | 10 | 10 | 15 | 2 |
| oz | 10 | 10 | 15 | 2 |
| dwt | 15 | 15 | 15 | 2 |
| gr | 2 | 2 | 2 | 2 |
| | | | | 11 |
| Ans | 11 | 10 | 15 | 2 |

8. A innkeeper bought four loads of hay. weighing as follows. viz. first load. 18 hundred 2 quarters and 14 lb. second load. 16 hundred 3 quarters 18 lb. third load. 22 hundred and 11 lb. fourth load. 24 hundred and 1 quarter: how much hay in all?

Ans. 11 tons 2 hundred.

| | Cwt | qr | lb |
|-----|-----|----|----|
| 1 | 18 | 2 | 14 |
| 2 | 16 | 3 | 18 |
| 3 | 22 | 0 | 11 |
| 4 | 24 | 1 | 00 |
| Ans | 11 | 0 | 00 |

9. Bought 8 loads of hay. each load weighing 1 ton 2 hundred 2 quarters 16 lb. how much hay in all?

Ans. 4 tons 2 hundred 16 lb.

| | T | c | q | lb |
|---|---|---|---|----|
| 8 | 4 | 2 | 0 | 16 |

Ans. 4 tons 2 hundred 16 lb.

10. Divide 4 ton 3 hundred 16 lb. into eight shares.

Ans. 1 ton 2 hundred 3:16 lb.

| | T | c | q | lb |
|---|---|---|---|----|
| 8 | 4 | 3 | 0 | 16 |
| 1 | 1 | 2 | 3 | 16 |

11. Bought 15 tracts of land. each containing 3 hundred acres 2 rods and 20 perches: what is the amount of the whole. Ans. 4509 acres 1 qr 20 rods

| A | R | P |
|-------|---|----|
| 300 | 2 | 20 |
| 1503 | 0 | 20 |
| 54509 | 1 | 20 |
| 3901 | 3 | 20 |
| 300 | 2 | 20 |

Compound Division

12. Divide a tract of land containing 4509 acres, 1 rood and 20 perches equally among 15 persons; what is each one's share?

Ans. 300 acres 2 roods 20 perches.

$$\begin{array}{r}
 5 \overline{) 4509} \quad 1 \quad 20 \\
 \underline{5000} \\
 509 \\
 \underline{5000} \\
 900 \\
 \underline{9000} \\
 1503 \\
 \underline{15030} \\
 4509 \quad 1 \quad 20
 \end{array}$$

13. Bought 149 bushels of wheat at 201 dollars 84 1/2 cents; what is it per bushel?

Ans. 1 doll ~~201~~ 12 cts

Bush

$$\begin{array}{r}
 149 \overline{) 201:34\frac{1}{2}} \quad 1 \cdot 12\frac{1}{2} \\
 \underline{149} \\
 223 \\
 \underline{149} \\
 144 \\
 \underline{149} \\
 89 \\
 \underline{89} \\
 358 \\
 \underline{358} \\
 358
 \end{array}$$

14. if a man spend 7 pence per day; how much will it amount to in year: Ans. 10 lbs. 11d.

L S D

$$\begin{array}{r}
 \begin{array}{ccc} 0 & 0 & 7 \\ \hline 0 & 5 & 10 \\ \hline 2 & 18 & 4 \\ \hline 8 & 15 & 0 \\ 1 & 15 & 0 \\ 0 & 2 & 11 \\ \hline 10 & 12 & 11 \end{array}
 \end{array}$$

15. What is the value of 1000 bushels of coal at 10 1/2 cents per bushel? Ans. 105 dolls.

$$\begin{array}{r}
 \frac{1}{2} = 1000 \quad 10\frac{1}{2} \\
 \hline
 10000 \\
 \underline{500} \\
 10500
 \end{array}$$

Compound Division

16. Bought 135 gallons of wine
 at 1 dollar and 62 1/2 cents per
 gallon: required the prime cost
 what it was sold for: and the
 gain: Ans. prime cost 219
 dolls. 37 1/2 cts: sold for 276
 dolls. 75 cts gain 57 dolls. 37 1/2 cts.

$$\begin{array}{r} 1.35 \\ 1.62\frac{1}{2} \\ \hline 2.97 \\ 810 \\ \hline 135 \end{array}$$

$$\begin{array}{r} 6.7\frac{1}{2} \\ 219.37\frac{1}{2} \end{array}$$

$$\begin{array}{r} 2.05 \\ 1.35 \\ \hline 10.25 \\ 615 \\ \hline 205 \\ 27675 \\ 21937\frac{1}{2} \\ \hline 57.37\frac{1}{2} \end{array}$$

17. if 27 Cwt. of sugar cost 47l.

12s. 10 1/2 d. what cost 1 Cwt:

Ans. 16. 15s. 3 1/2 d.

$$\begin{array}{r} 944 = 12 = 10\frac{1}{2} \\ 3 \overline{) 5510\frac{1}{2}} \\ \underline{15} \phantom{10\frac{1}{2}} \\ 15 \phantom{10\frac{1}{2}} \\ \underline{15} \phantom{10\frac{1}{2}} \\ 0 \phantom{10\frac{1}{2}} \end{array}$$

$$\begin{array}{r} 27 \overline{) 47} = 12 = 10\frac{1}{2} \\ \underline{27} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

18. Suppose a man has an estate of 9408 dollars. which he divides among his four sons: to his eldest he gives 2/5 and to the other three an equal share each of the remain. der: what is the share of each?

Ans. eldest son. 3883 dolls. 20 cents. other sons. each 1941 dolls. 60 cents.

$$\begin{array}{r} 9408 \\ 2 \\ \hline 519416 \\ 38832 = 20 \end{array}$$

$$\begin{array}{r} 59408 \\ 1941 = 60 \end{array}$$

Reduction Reduction

1. Reduce 100 cents to pence.

$$\begin{array}{r} 10 \overline{) 100 \text{ cents}} \\ \underline{90} \\ 10 \text{ pence. Ans.} \end{array}$$

5. Reduce 260 cents to pence.

Ans. 23nd.

2. Reduce 90 pence to cents

$$\begin{array}{r} 9 \overline{) 90 \text{ pence}} \\ \underline{10} \\ 100 \text{ cents. Ans.} \end{array}$$

$$\begin{array}{r} 260 \\ \underline{26} \\ 234 \end{array}$$

6. Reduce 480l. 19s. 9d. to cents.

3. Reduce 125l. 10s. 6d. to farthings.

$$\begin{array}{r} 125 \text{ l. } 10 \text{ s. } 6 \text{ d. } \\ \underline{20} \\ 2510 \text{ shillings } \\ \underline{12} \\ 30126 \text{ pence } \\ \underline{4} \\ 120506 \text{ farthings Ans.} \end{array}$$

$$\begin{array}{r} \text{£} \quad \text{s} \quad \text{d} \\ 480 \quad 19 \quad 9 \\ \underline{20} \\ 9619 \\ \underline{12} \\ 911548 \text{ } \\ \underline{9} \\ 12826 \quad \frac{3}{4} \\ \underline{128363} \quad \frac{2}{3} \end{array}$$

7. Reduce 11658 pence to pounds.

Ans. 19l. 8s. 2d.

4. Reduce 120506 farthings to pounds.

Ans. 125l. 10s. 6d.

$$\begin{array}{r} 12 \overline{) 11658} \\ \underline{20} \\ 388 \text{ } \\ \underline{19} \\ 19 = 8 = 2 \end{array}$$

11) 120506 farthings

8. Reduce 648 pence to cents.

Ans. 720 cents.

$$\begin{array}{r} 9 \overline{) 648} \\ \underline{72} \\ 720 \end{array}$$

$$\begin{array}{r} 12 \overline{) 30126 \frac{1}{2}} \\ \underline{20} \\ 2510 \text{ } \\ \underline{12} \\ 30126 \text{ } \\ \underline{4} \\ 120506 \end{array}$$

Reduction Reduction

7. Reduce 420 cents to pence.

Ans. 648 pence.

$$\begin{array}{r} 10 \overline{) 420} \\ 42 \\ \hline 648 \end{array}$$

10. Reduce 24235 half-pence to pounds.

Ans. 50l. 9s. 9½d.

$$\begin{array}{r} 2 \overline{) 24235} \\ 12117 \frac{1}{2} \\ \hline 20 \overline{) 1009} = 9 \\ 50 = 9 = 9 \frac{1}{2} \end{array}$$

11. How many pounds. pennsylvania currency. in 216 french crowns:

Ans. 89l. 2s.

$$\begin{array}{r} 216 \\ 99 \\ \hline 1944 \\ 1944 \\ \hline 12 \overline{) 21384} \\ 20 \overline{) 1782} \\ 89 = 2 \end{array}$$

12. in 24l. 19s. how many cents and dollars.

Ans. 4960 cents — 49 dolls. 60cts.

$$\begin{array}{r} 24 \text{ l. } 19 \text{ s. } \\ 20 \text{ s. } 10 \text{ d. } \\ \hline 597 \\ 12 \\ \hline 9 \overline{) 4164} \\ 496 \\ \hline 100 \overline{) 4960} \\ 49 = 60 \end{array}$$

$$49 \overline{) 60}$$

13. in 375l. pennsylvania currency. how many dollars.

Ans. 1000 dolls.

$$\begin{array}{r} 375 \\ 20 \\ \hline 4500 \\ 12 \\ \hline 9 \overline{) 90000} \\ 10000 \\ \hline 100000 \end{array}$$

14. Troy Weight

1. Reduce 115200 grains to pounds.

Ans. 20lb.

$$\begin{array}{r} 20 \overline{) 115200} \\ 4000 \\ \hline 20 \overline{) 2110} \\ 20 \\ \hline 20 \end{array}$$

2. Reduce 30lb. to grains.

Ans. 142800gr.

$$\begin{array}{r} 30 \\ 24 \\ \hline 420 \\ 20 \\ \hline 142800 \\ 12 \\ \hline 142800 \end{array}$$

Reduction Reduction

34

3. Reduce 45648 penny weights to ounces. Ans. 228203.8 dwt.

$$\begin{array}{r} 20 \overline{) 45648} \\ 228203.8 \end{array}$$

11. Reduce 11 lb. 8 oz. 15 dwt 20 gr. to grains. Ans. 24260 gr.

$$\begin{array}{r} \text{lb} \quad \text{oz} \quad \text{dwt} \quad \text{gr} \\ 11 \quad 8 \quad 15 \quad 20 \\ 12 \end{array}$$

$$\begin{array}{r} 56 \\ 20 \end{array}$$

$$\begin{array}{r} 1135 \\ 21 \end{array}$$

$$\begin{array}{r} 24260 \end{array}$$

5. Reduce 24260 grains to pounds. Ans. 11 lb. 8 oz. 15 dwt. 20 gr.

$$\begin{array}{r} 21 \overline{) 24260} \\ 20 \overline{) 1135} = 11 \\ 12 \overline{) 56} = 15 \end{array}$$

$$11 = 8 = 15 = 11$$

6. In 24 spoons. each weighing 8 dwt. 6 gr. how many grains. Ans. 4752 gr.

$$\begin{array}{r} \text{dwt} \quad \text{gr} \\ 8 \quad 6 \end{array}$$

$$24$$

$$198$$

$$24$$

$$792$$

$$376$$

$$4752$$

Avoirdupois Weight

1. Reduce 3 tons to pounds. Ans. 6720 lb.

$$\begin{array}{r} 3 \\ 20 \\ \hline 60 \\ 11 \\ \hline 240 \\ 28 \\ \hline 1920 \\ 480 \\ \hline 6720 \end{array}$$

2. Reduce 2864200 drams to tons. Ans. 5 tons.

$$\begin{array}{r} 16 \overline{) 2864200} \\ 16 \overline{) 149200} \\ 16 \overline{) 11200} \end{array}$$

$$\begin{array}{r} 16 \overline{) 400} \\ 20 \overline{) 100} \\ 5 \end{array}$$

3. Reduce 5 tons to drams. Ans. 2864200 dr.

$$\begin{array}{r} 5 \\ 16 \\ \hline 80 \\ 16 \\ \hline 1280 \\ 28 \\ \hline 35840 \\ 11 \\ \hline 143360 \\ 20 \\ \hline 2867200 \end{array}$$

Reduction Reduction

4. In 6 barrels of flour, each weighing 1 cwt. 3 gr. how many pounds.

Ans. 1176 lb.

$$\begin{array}{r} 1 = 3 \\ 4 \\ \hline 4 \\ 28 \\ \hline 196 \\ 6 \\ \hline 1176 \end{array}$$

5. In 16 cwt. 2 gr. 14 lb. how many pounds: Ans. 1862 lb.

| | | |
|------|----|----|
| cwt | gr | lb |
| 16 | 2 | 14 |
| 4 | | |
| 66 | | |
| 28 | | |
| 582 | | |
| 133 | | |
| 1862 | | |

6. In a load of hay weighing 2876 lb. how many hundred.

Ans. 25 cwt. 2 gr. 20 lb.

$$\begin{array}{r} 28 \overline{) 2876} \\ 4 \overline{) 102} = 20 \\ 20 \overline{) 55} = 2 \\ 15 = 2 = 20 \end{array}$$

1. Reduce 15 lb. to scruples.

Ans. 11320 sc.

$$\begin{array}{r} 15 \\ 3 \\ \hline 45 \\ 8 \\ \hline 360 \\ 12 \\ \hline 4320 \end{array}$$

2. In a bottle containing 3 lb. of calomel. how many grains: Ans. 14280 gr.

$$\begin{array}{r} 3 \\ 20 \\ \hline 60 \\ 3 \\ \hline 180 \\ 1440 \\ 12 \\ \hline 14280 \end{array}$$

3. In 24 lb. of drugs. how many parcels. each 16 drams:

Ans. 15 parcels.

$$\begin{array}{r} 24 \text{ lb} \times 8 \text{ oz} \\ 2 \dots 6 \\ 12 \\ 30 \\ 8 \\ \hline 16 \overline{) 240} 15 \\ 16 \\ \hline 80 \\ 80 \end{array}$$

4. In 546000 grains. how many pounds.

Ans. 100 lb.

Reduction Reduction

33

20) 546000

3) 28800

8) 9600

12) 1200

100

Long Measure Long Measure
Long Measure

1 Reduce 260 miles to inches.
Ans. 164143600 inches.

Cloth Measure Cloth Measure

1. Reduce 250 yards to nails.
Ans. 4000 nails.

250

4

1000

4

4000

260
8

2080

40

83200

5 1/2

416000

416000

457600

3

1272800

12

164143600

2. In 8642 nails how many
ells English:
Ans. 432 ells C. nails.

8642

4) 17284

432 = 2

2. Reduce 11 miles & furlongs 38
perches 2 yards 2 feet. to Law
tergers. Ans. 2280060 li.

11 7 38 2 2

11

7

38

2

2

95

40

3835

5 1/2

19142

1914

21111

3

03335

12

2280020

2

2280060

3. In 324 ells french how
many yards:
Ans. 486 yds.

324

6

4) 1944

486

4. In 16 bales of cloth. each measuring
36 ells flemish. how many yards.
Ans. 432 yds.

36

16

216

36

576

3

4) 1728

432

Reduction Reduction

3. Reduce 1267200 feet to geographical degrees.
Ans. 4 degrees.

$$\begin{array}{r} 3 \overline{) 1267200} \\ 220 \overline{) 422400} \quad 1920 \\ \underline{220} \\ 2024 \\ \underline{1780} \\ 440 \\ \underline{440} \\ 0 \end{array}$$

$$\begin{array}{r} 8 \overline{) 1720} \\ 26 \overline{) 2104} \\ \underline{210} \\ 0 \end{array}$$

4. Reduce 3 leagues 2 furlongs 110 yards 1 foot 5 inches. to inches.
Ans. 59005 inches.

$$\begin{array}{r} \text{L} \quad \text{fur} \quad \text{yds} \quad \text{ft} \quad \text{in} \\ 3 \quad 2 \quad 110 \quad 1 \quad 5 \\ \hline 3 \\ 3 \\ 9 \\ 3 \\ \hline 411 \\ 220 \\ \hline 1590 \\ 148 \\ \hline 16398 \\ 49181 \\ \hline 12 \\ \hline 590059 \end{array}$$

5. How many inches will reach round the world. at 60 miles to a degree: Ans. 1365546000 inches.

$$\begin{array}{r} 860 \text{ fms} \\ 21600 \text{ ft} \\ \hline 179800 \text{ fur} \\ 3 \overline{) 456000} \\ \underline{345600} \\ 110400 \text{ fms} \\ \underline{110400} \\ 0 \end{array}$$

Land Measure.

1. Reduce 25 acre to perches.
Ans. 4000 perches.

$$\begin{array}{r} 25 \\ 25 \\ \hline 100 \\ 40 \\ \hline 4000 \end{array}$$

2. Reduce 146000 perches to acres.
Ans. 1100 acres.

$$\begin{array}{r} 20 \overline{) 146000} \\ \underline{4400} \\ 1100 \end{array}$$

3. A tract of land containing 640000 perches is to be divided into 400 equal shares. how many acres will be in each share: Ans. 10 acres.

$$\begin{array}{r} 400 \overline{) 640000} \\ \underline{1600} \\ 160 \end{array}$$

Reduction James N^o 35

4 In 10 acres how many square inches: Ans. 62726400 inches.

$$\begin{array}{r}
 10 \\
 4 \\
 \hline
 40 \\
 40 \\
 \hline
 1600 \\
 30 \frac{1}{4} \\
 \hline
 48000 \\
 400 \\
 \hline
 48400 \\
 9 \\
 \hline
 136600 \\
 144 \\
 \hline
 1442400 \\
 1442400 \\
 \hline
 436600 \\
 \hline
 62726400
 \end{array}$$

(cubic or solid Measure)

1 Reduce 3200 feet of wood to cords. Ans. 25 cords.

$$\begin{array}{r}
 128 \overline{) 3200} (25 \\
 256 \\
 \hline
 640 \\
 640 \\
 \hline
 0
 \end{array}$$

2 In 20 tons of square timber how many feet: Ans. 1000 feet.

$$\begin{array}{r}
 20 \\
 50 \\
 \hline
 1000
 \end{array}$$

3 In 30 tons of square round timber how many inches: Ans. 2043600 inches.

$$\begin{array}{r}
 30 \\
 40 \\
 \hline
 1200 \\
 1428 \\
 \hline
 4600 \\
 2400 \\
 \hline
 1200 \\
 \hline
 2043600
 \end{array}$$

21212121

4 In a grindstone 48 inches diameter and 6 inches thick how many feet:

$$\begin{array}{r}
 48 \text{ diameter} \\
 24 \text{ half do.} \\
 \hline
 42 \\
 24 \\
 \hline
 288 \\
 144 \\
 \hline
 1428 \\
 6 \\
 \hline
 1428 \overline{) 10368} (6 \text{ cubic feet. Ans} \\
 10368 \\
 \hline
 0
 \end{array}$$

5 In a mill-stone 4 feet 6 inches diameter and average 18 inches in thick-ness. how many cubic feet

$$\begin{array}{r}
 54 \\
 24 \\
 \hline
 81 \\
 24 \\
 \hline
 564 \\
 162 \\
 \hline
 2184 \\
 18 \\
 \hline
 14496 \\
 2184 \\
 \hline
 12312
 \end{array}$$

Ans. Ans.

$$\begin{array}{r}
 1428 \overline{) 39366} (22 \text{ feet } 1350 \text{ in} \\
 3256 \\
 \hline
 4806 \\
 3456 \\
 \hline
 1350
 \end{array}$$

36 Reduction Reduction

Times Time

Liquid Measure.

1. Reduce 8 Weeks & days & hours
20 minutes. to minutes.

Ans. 83900 min. $\frac{7}{8}$ h $\frac{20}{60}$ mi

$$\begin{array}{r} 8 \\ 7 \\ \hline 58 \\ 24 \\ \hline 238 \\ 116 \\ \hline 1398 \\ 60 \\ \hline 83900 \end{array}$$

2. Reduce 10 years to seconds.

Ans. 315 576 000 sec.

$$\begin{array}{r} 365 = 6 \\ 24 \\ \hline 1466 \\ 720 \\ \hline 8766 \\ 10 \\ \hline 87660 \\ 60 \\ \hline 525900 \\ 60 \\ \hline 31557600 \end{array}$$

3. How many seconds in one week.

Ans. 604800 sec.

$$\begin{array}{r} 7 \\ 24 \\ \hline 28 \\ 14 \\ \hline 168 \\ 60 \\ \hline 10080 \\ 60 \\ \hline 604800 \end{array}$$

1. Reduce 4 huns to pints. Ans 4096 pints.

$$\begin{array}{r} 4 \\ 4 \\ \hline 16 \\ 64 \\ \hline 48 \\ 96 \\ \hline 1008 \\ 4 \\ \hline 4032 \\ 2 \\ \hline 8064 \end{array}$$

2. Reduce 4096 pints to hogsheds. Ans. 8 hhd.

$$\begin{array}{r} 4096 \\ 2 \\ \hline 2048 \\ 4 \\ \hline 8192 \\ 504 \\ \hline 4096 \end{array}$$

3. Reduce 8 hogsheds to pints. Ans 1418 pints.

$$\begin{array}{r} 38 \\ 23 \\ \hline 114 \\ 228 \\ \hline 2394 \\ 4 \\ \hline 9576 \\ 19152 \end{array}$$

4. Reduce 8 bushels 2 pecks 4 quarts to pints. Ans. 604 pints.

Try Measure Try Measure

1. Reduce 8 bushels 2 pecks 4 quarts to pints. Ans 604 pints.

$$\begin{array}{r} 8 \\ 78 = 3 = 1 \\ 4 \\ \hline 315 \\ 8 \\ \hline 2520 \\ 2 \\ \hline 5040 \end{array}$$

2. Reduce 2196 pints to bushels.

Ans. 34 bu. 1 pe. 2 qt

$$\begin{array}{r} 2196 \\ 81098 \\ 4 \\ \hline 134 = 2 \\ 34 = 1 = 2 \end{array}$$

of Decimal Arithmetic

Addition of Decimals James

Examples

Examples

Examples

$$\begin{array}{r} 1: \quad 2468.5036 \\ \quad 521.6428 \\ \quad 32.6664 \\ \hline 3021.5128 \end{array}$$

$$\begin{array}{r} 2: \quad 346666.66666666 \\ \quad 46666.00000000 \\ \quad 3466.26800000 \\ \hline 3923400.3687078 \\ \quad 463400.3687078 \\ \hline 3923400.3687078 \end{array}$$

3. Add $283.604 + 490006.003275 + 21.05 + 1.2 + 6200.3476$
 Ans. 496512.204875

$$\begin{array}{r} 283.604 \\ 490006.003275 \\ 21.05 \\ 1.2 \\ 6200.3476 \\ \hline 496512.204875 \end{array}$$

4. Add one hundred and twenty-five and five-tenths.
 + ten thousands and five millionths. + fifteen and seven-hy-
 - two thousandths. + two and one-hundredth.

Ans. 10142.582005

$$\begin{array}{r} 125.5 \\ 10000.0000005 \\ 15.072 \\ 2.01 \\ \hline 10142.582005 \end{array}$$

Section 2.

Subtraction of Decimals

1. From 6432.50434
Take 369.95124
Rem 6062.55008

2. 848.045000
162.459368
685.585632
848.045000

3. 15.6544
7.3500
8.3044
15.6544

4. From 45.000 Take 23.65482
Ans. 21.34518.

45.00500
23.65482
21.35018

5. From six hundred and twenty
and two-tenths. Take two
hundred and two thousandths.
Ans. 420.198.

620.200
200.002
420.198

Multiplication of Decimals

Multiply 29.831
by .952
59662
144155
265479
28.399112

2. 24.021
423
42063
48042
96084
101.60883

3. 22.2043
12345
1110215
888172
666129
444086
222043
2441120835

4. Multiply .385746
00463
1154238
2314446
1542984
0000000
0000000
000148600298

5. 158.694
2245
493470
158694
446082
317388
3673.76610

6. 024653
400022
049306
049306
00000542366

Division of Decimals: SSSSSS

Examples

$$\begin{array}{r} 29.831 \overline{) 28.399112} \quad (952 \\ 268479 \\ \hline 155121 \\ 149155 \\ \hline 59662 \\ 59662 \\ \hline \end{array}$$

1.

$$\begin{array}{r} 3 \overline{) 10} (3.3333+ \\ 9 \\ \hline 10 \\ 9 \\ \hline 10 \\ 9 \\ \hline 10 \\ 9 \\ \hline 1 \end{array}$$

5

$$\begin{array}{r} 24.021 \overline{) 101.60883} \quad (4.23 \\ 96084 \\ \hline 55248 \\ 48042 \\ \hline 72063 \\ 72063 \\ \hline \end{array}$$

2.

$$\begin{array}{r} 9 \overline{) 9} (10 \\ 9 \\ \hline \end{array}$$

6

$$\begin{array}{r} 23.4 \overline{) 65321} \quad (2756.16+ \\ 444 \\ \hline 1742 \\ 1654 \\ \hline 1331 \\ 1185 \\ \hline 1460 \\ 1422 \\ \hline 380 \\ 234 \\ \hline 1430 \\ 1422 \\ \hline 8 \end{array}$$

3

$$\begin{array}{r} 000463 \overline{) 00178600398} \quad (3857446 \\ 1389 \\ \hline 3970 \\ 3704 \\ \hline 2660 \\ 2315 \\ \hline 3453 \\ 3241 \\ \hline 2129 \\ 1852 \\ \hline 2448 \\ 2448 \\ \hline \end{array}$$

9

X

$$\begin{array}{r} 64.25 \overline{) 234.40525} \quad (3.653 \\ 19275 \\ \hline 41955 \\ 38550 \\ \hline 34052 \\ 32125 \\ \hline 19275 \\ 19275 \\ \hline \end{array}$$

4

Reduction of Decimals

Sections.

1. Reduce $\frac{1}{4}$ to a decimal.

$$\begin{array}{r} 4 \overline{)100} \text{ mill } \\ 25 \text{ } 90 \text{ } 100 \end{array}$$

2. Reduce $\frac{1}{2}$ to a decimal.

$$\begin{array}{r} 2 \overline{)10} \\ 5 \end{array}$$

3. Reduce $\frac{3}{4}$ to a decimal.

$$\begin{array}{r} 4 \overline{)300} \\ 75 \end{array}$$

4. Reduce $\frac{7}{8}$ to a decimal.

$$\begin{array}{r} 8 \overline{)7000} \\ 5600 \end{array}$$

5. Reduce $\frac{1}{5}$ to a decimal.

$$\begin{array}{r} 25 \overline{)100} \\ 00 \end{array}$$

6. Reduce $\frac{57}{60}$ to a decimal.

$$\begin{array}{r} 60 \overline{)570} \\ 95 \end{array}$$

7. Reduce $\frac{6}{15}$ of a dollar to cents.

$$\begin{array}{r} 15 \overline{)600} \\ 40 \end{array}$$

3. Examples } Example 3

1. Reduce 17s. 8 $\frac{3}{4}$ d. to the decimal of a pound

$$\begin{array}{r} 4 \overline{)3} \\ 12 \overline{)8.75} \\ 20 \overline{)17.825} \\ 16.66 \text{ } + \text{ Ans} \\ .8864583 \end{array}$$

2. Reduce 19s. to the decimal of a pound

$$\begin{array}{r} 20 \overline{)19} \\ 95 \end{array}$$

3. Reduce 3d. to the decimal of a shilling.

$$\begin{array}{r} 12 \overline{)3} \\ 25 \end{array}$$

4. Reduce 3d. to the decimal of a pound.

$$\begin{array}{r} 12 \overline{)3} \\ 20 \overline{)25} \\ .0125 \end{array}$$

5. Reduce 11wt. 2gr. to the decimal of a ton.

$$\begin{array}{r} 4 \overline{)2} \\ 20 \overline{)4.5} \\ 225 \end{array}$$

6. Reduce 2gr. 14lb. to the decimal of a cwt.

$$\begin{array}{r} 28 \overline{)14} \\ 4 \overline{)2.5} \\ .625 \end{array}$$

7. Reduce 3gr. 3na. to the decimal of a yard.

$$\begin{array}{r} 4 \overline{)3} \\ 4 \overline{)3.75} \\ .9375 \end{array}$$

1. Reduce .8864583 of a pound to its equivalent value in integer

$$\begin{array}{r} 8864583 \\ 20 \\ 17.7291660 \\ 12 \\ 8.7499920 \\ 4 \\ 2.4499680 \end{array}$$

2. What is the value of 45 of a pound: Ans. 15s.

$$\begin{array}{r} 45 \\ 20 \\ 15.00 \end{array}$$

3. What is the value of 10 of a pound Troy: Ans. 50s. 8dwt.

$$\begin{array}{r} 7 \\ 12 \\ 8.4 \\ 20 \\ 8.0 \end{array}$$

Reduction of Animals

4. what is the value of .617 of a cwt.: Ans. 2 qrs. 13 lb. 10 s. 10 d.

$$\begin{array}{r}
 617 \\
 \underline{4} \\
 2468 \\
 \underline{28} \\
 8744 \\
 \underline{986} \\
 13104 \\
 \underline{16} \\
 624 \\
 \underline{104} \\
 1664 \\
 \underline{16} \\
 3984 \\
 \underline{664} \\
 10624
 \end{array}$$

5. what is the value of .3375 of an acre: Ans. 1 rood 14 perches

$$\begin{array}{r}
 3375 \\
 \underline{4} \\
 13500 \\
 \underline{40} \\
 140000
 \end{array}$$

6. what is the value of .258 of a tun of wine: Ans. 1 hhd. 2 + gal

$$\begin{array}{r}
 258 \\
 \underline{4} \\
 1032 \\
 \underline{63} \\
 96 \\
 \underline{192} \\
 2016
 \end{array}$$

7. what is the proper quantity of .761 of a day: Ans. 18 h. 15 m. 50.4 sec.

$$\begin{array}{r}
 761 \\
 \underline{24} \\
 3044 \\
 \underline{1522} \\
 18264 \\
 \underline{60} \\
 15840 \\
 \underline{60} \\
 50400
 \end{array}$$

8. what is the ~~sum~~ proper quantity of .3 of a year: Ans. 109 d. 12 h.

8. what is the proper quantity of .7 of a lb. of silver: Ans. 8 oz. 8 dwt.

$$\begin{array}{r}
 7 \\
 \underline{12} \\
 84 \\
 \underline{20} \\
 80
 \end{array}$$

9. what is the proper quantity of .3 of a year: Ans. 109.12 h.

$$\begin{array}{r}
 365 \\
 \underline{3} \\
 1095 \\
 \underline{24} \\
 126
 \end{array}$$

10. what is the difference between .41 of a day and .16 of an hour: Ans. 9 h. 40 m. 48 sec.

$$\begin{array}{r}
 41 \\
 \underline{24} \\
 164 \\
 \underline{52} \\
 984 \\
 \underline{60} \\
 5040 \\
 \underline{60} \\
 4400 \\
 \underline{16} \\
 60 \\
 960 \\
 \underline{3700}
 \end{array}$$

| | | |
|---|----|----|
| h | m | s |
| 9 | 50 | 24 |
| 0 | 9 | 28 |
| 9 | 40 | 48 |

11. what is the sum of .18 t. .19 cwt. .14 qrs. and .7 lb. Ans. 3 cwt. 2 qrs. 15.54 lb.

| | | | |
|------|------|------|----|
| 18 | 19 | 14 | 7 |
| 354 | 384 | 280 | 14 |
| 4 | 28 | 28 | |
| 253 | 364 | 2548 | |
| 28 | 28 | | |
| 431 | 2912 | | |
| 106 | 726 | | |
| 1491 | | | |

The Single Rule

1. If 8 yards of cloth cost 32 dollars
ans. what will 24 yards cost:

$$\begin{array}{r} \text{yds. } 8 \text{ } \$ 32 :: 24 \text{ } \$ 96 \\ \hline 128 \\ 64 \\ \hline 8) 768 \\ \hline 96 \text{ Ans} \end{array}$$

2. When sugar is sold at 12 dollars
32 cents per cwt. what will 16 lb. cost:
Ans. 1 doll. 76 cts.

$$\begin{array}{r} \text{lb. } 112 :: 12 \cdot 32 :: 16 \\ \hline 112) 19712 (176 \cdot 32 \\ \hline 112 \quad 48 \\ \hline 551 \quad 32 \\ 784 \quad 16 \\ \hline 6721769712 (112 \\ \hline 672 \quad 76 \\ \hline 211 \\ 176 \\ \hline 352 \\ 352 \\ \hline \end{array}$$

3. what is the amount of 3 cwt. of coffee
at 36 cents per pound:

$$\begin{array}{r} \text{lb. } 1 :: 36 :: 3 \text{ cwt. } 36 \\ \hline 1 :: 36 :: 36 \\ \hline 216 \\ 144 \\ \hline 108 \\ 108 \\ \hline 120.96 \\ \hline \end{array}$$

4. What will 4 pieces of linen
come to containing 30 yds. 25 cts.
27 yards at 12 cents per
yard:

$$\begin{array}{r} 23 \\ 24 \\ 25 \\ 27 \\ \hline 99 \\ \hline 125 \\ 648 \\ \hline 71.28 \end{array}$$

5. What will 4 cwt. 2 qrs 8 lb. of
iron come to at 14 cents per lb.
Ans. 61 dolls. 44 cts.

$$\begin{array}{r} \text{lb. } 4 :: 14 :: 2 \cdot 8 \\ \hline 4 :: 14 :: 28 \\ \hline 15 \\ 28 \\ \hline 152 \\ 36 \\ \hline 512 \\ 118 \\ \hline 4096 \\ 2048 \\ \hline 4) 24576 \\ \hline 61.44 \end{array}$$

6. what will 128 lb. of pork come
to at 8 cts. per pound:

$$\begin{array}{r} \text{lb. } 128 :: 8 :: 128 \\ \hline 128 \\ 64 \\ \hline 16 \\ \hline 128) 1024 (8 \\ \hline 1024 \\ \hline \end{array}$$

of Three Direct by J. Mc Cormick

7. If $9\frac{1}{2}$ dozen pair of stockings cost 9 dollars

Stockings
 9.5
 12
 Pair $1140 :: 6840 : 3$
 $114 \overline{) 205.20} (1.80$
 114
 912
 912

10. If 14 cwt. 3 qrs. 17 lb. of sugar cost 320 dollars 80 cts. what must be paid for 60 cwt. Ans. 6 cents.

cwt qrs lb ϕ cts
 $14 : 3 : 17 :: 320.80 : 6$
 14
 28
 575
 143
 $2005 \overline{) 2005}$
 16
 12030
 2005
 $32080 \overline{) 192480} (6$
 192480
 Ans

8. If 20 bushels of oats cost 9 dollars 80 cents what will 3 bushels come to: Ans. 1 doll. 48 cts.

bu ϕ cts
 $20 :: 9.80 : 3$
 $20 \overline{) 28.80} (1.44$
 20
 88
 80
 80

11. If 9 lb. of silver is worth 94 dollars what is the value of 1503 Ans. 1 doll. 28 cts.

lb ϕ cts
 $9 : 94 :: 1503 : 1.28$
 9
 455
 94
 $1164 \overline{) 14545} (1.25$
 1164
 2910
 2828
 5820
 5820

9. A merchant bought a piece of cloth for 16 dollars 50 cents at 46 cents per yard; how many yards were there in the piece:

Ans. 22 yds:
 ϕ cts yds
 $16.50 :: 22 : 16.50$
 $1650 : 1650$
 1100
 132
 22
 $1650 \overline{) 36300} (22$
 3300
 3300
 3300

12. If 125.5 acres sold for 624.5 dollars what will 4.75 acres cost:

Ans. 23 dolls. 75 cts.
 $125.5 : 624.5 :: 4.75 : 23.75$
 $1255 \overline{) 2950625} (23.75$
 251000
 440625
 376500
 941250
 878500
 627500
 627500

Continued Continued

13. \$1.5 gallons of wine cost 11 dollars 50 cents. what will 1.5 tons cost:

Ans. 1134 dollars.

| | | |
|--------|----------|------|
| gal | \$ | ¢ |
| 1.5 :: | 4.50 : | 1.5 |
| | 3750 | 11 |
| | 36000 | 66 |
| | 3150 | 63 |
| | 1350 | 130 |
| | 14701000 | 360 |
| | | 3750 |

| | | |
|-----|---------|---------|
| 1.5 | 1401000 | 1134.00 |
| 1.5 | | |
| 20 | | |
| 15 | | |
| 51 | | |
| 45 | | |
| 60 | | |
| 60 | | |
| 00 | | |

15. when iron is sold for 22¢ per ton. what will 1 gr. 14 lb. cost: Ans. 11 dollars 20 cts.

| | | |
|--------------------|-----|----|
| 22 | ¢ | 14 |
| 1 :: 22 :: 1 :: 14 | | |
| 20 | 25 | |
| 20 | 12 | |
| 4 | 42 | |
| 80 | 224 | |
| 28 | 168 | |
| 640 | 84 | |
| 160 | 84 | |
| 2240 | 84 | |

| | | |
|------|------|-------|
| 2240 | 9408 | 11.20 |
| | 8960 | |
| | 4480 | |
| | 4480 | |

16. A merchant paid 1402 dollars 50 cents for flour, at 5 dollars 50 cents per barrel: how many barrels must he receive.

Ans. 255 barrels.

| | |
|---------------------|---|
| \$ | ¢ |
| 5.50 : 1 :: 1402.50 | |

| | | |
|------|--------|-----|
| 5.50 | 140250 | 255 |
| | 1400 | |
| | 3025 | |
| | 2750 | |
| | 2750 | |
| | 2750 | |

14. How many reams of paper at, dollar 66 cents, 1 dollar 44 cents, and 2 dollars 31 cents per ream may be purchased for 528 dollars 66 cents of each an equal number.

Ans. 89 reams of each sort.

| | | |
|--------------------|----|---|
| 166 | \$ | ¢ |
| 194 | | |
| 231 | | |
| 894 :: 1 :: 528.66 | | |

| | | |
|-----|-------|----|
| 594 | 52866 | 89 |
| | 4452 | |
| | 5346 | |
| | 5346 | |

17. A man has a yearly salary of 1186 dollars 25 cents. how much is it per day: Ans. 3 dolls 25 cts.

| | | |
|--------------------|----|---|
| Days | \$ | ¢ |
| 365 : 1186.25 :: 1 | | |

| | | |
|-----|--------|------|
| 365 | 118625 | 3.25 |
| | 1095 | |
| | 912 | |
| | 930 | |
| | 1825 | |
| | 1825 | |

Continued in September

18. A man spends 2 dollars 25 cents per day, and saves 378 dollars 45 cents at the end of the year. what is his yearly salary.

Ans. 1200 dolls.

$$\begin{array}{r} \text{As days} \quad 365 \\ 2,25 : : 365 \\ \hline 225 \\ 1825 \\ 730 \\ \hline 80125 \\ 37875 \\ \hline 1200,00 \end{array}$$

19. What will 1428 lb. 10 cwt. 19 lb. 12 oz. of hay come to at 1 dollar 12 cents per cwt. Ans. 101 dolls. 20 cts.

$$\begin{array}{r} \text{hundred} \quad \text{weight} \quad \text{lb} \quad \text{oz} \\ 1 : 112 : : 1428 : 159936 \\ \hline 112 \\ 28 \\ 28 \\ 8 \\ \hline 112 \end{array}$$

$$\begin{array}{r} 20 \\ 90 \\ 4 \\ 261 \\ 28 \\ 2400 \\ 722 \\ \hline 10120 \\ 112 \\ \hline 20240 \\ 10120 \\ 10120 \\ \hline 112 \overline{) 1133440} \overline{) 101,20} \\ 112 \\ \hline 134 \\ 112 \\ \hline 224 \\ 224 \\ \hline 0 \end{array}$$

20. how much will a grindstone 11 feet 6 inches diameter, and 9 inches thick, come to at 1 dollar 10 cents per cubic foot. Ans. 12 dolls. 53 cts.

$$\begin{array}{r} \text{ft} \quad \text{in} \quad \text{in} \\ 11 : 6 : 9 \\ \hline 12 \\ 54 \\ 27 \\ \hline 81 \\ 24 \\ \hline 564 \\ 162 \\ \hline 2164 \\ 9 \\ \hline 19683 \\ 110 \\ \hline 196830 \\ 19683 \\ \hline 1428 \overline{) 2165130} \overline{) 12,53} \\ 1428 \\ \hline 4371 \\ 3456 \\ \hline 9153 \\ 8640 \\ \hline 5130 \\ 5184 \end{array}$$

21. What will a grindstone 28 inches diameter, and 3.5 inches thick, come to at 1 dollar 90 cents per cubic foot. Ans. 2 dolls. 26 cts.

$$\begin{array}{r} \text{in} \quad \text{in} \\ 28 : 3.5 \\ \hline 14 \\ 42 \\ 14 \\ \hline 138 \\ 42 \\ \hline 588 \\ 35 \\ \hline 2940 \\ 1964 \\ \hline 1428 : 190 : 20580 \\ 190 \\ \hline 1852200 \\ 20580 \\ \hline 1428 \overline{) 2910200} \overline{) 2,26} \\ 1428 \\ \hline 4542 \\ 3456 \\ \hline 10860 \\ 10868 \\ \hline 492 \end{array}$$

Single Rule

22. At 22l. 8s. per ton. what
will 203t. 9wt. 3gr. 3lb. of tobacco
come to: Ans. 4558.8s.

$$\begin{array}{r}
 1 : 22 :: 8 : 203 \\
 20 : 448 \\
 20 : 4069 \\
 4 : 16279 \\
 80 : 130235 \\
 28 : 22568 \\
 640 : 455805 \\
 160 : 448 \\
 2240
 \end{array}$$

$$\begin{array}{r}
 28 \overline{) 2240} \\
 80 \\
 11 \overline{) 80} \\
 20 \\
 20 \overline{) 10}
 \end{array}$$

23. If 850 dolls. 50 cents is paid
for 18 pieces of cloth at the rate
of 11 dollars 25 cents for 5 yards.
how many yards were in each piece.
allowing a equal number to each
piece: Ans. 21 yds.

$$11.25 : 5 :: 850.50$$

$$\begin{array}{r}
 11.25 \overline{) 850.50} \\
 3375 \\
 8475 \\
 9000 \\
 9000
 \end{array}$$

$$\begin{array}{r}
 18 \overline{) 378} \\
 36 \\
 18 \\
 18
 \end{array}$$

24. If 12 1/2 yards of muslin cost
1l. 17s. 6d. what is it per yard.
Ans. 3s.

$$\begin{array}{r}
 12.5 : 1 : 17 : 6 : 10 \\
 20 \\
 37 \\
 12 \\
 450 \\
 1.0 \\
 12.5 \overline{) 450.0} \\
 375 \\
 750 \\
 750
 \end{array}$$

$$12 \overline{) 36} \quad 3 \text{ Ans}$$

25. If a staff 4 feet long cast a
shadow on level ground 4 feet
long. what is the height of a stee
ple whose shade at the same time
is 218 feet 9 inches: Ans. 125 feet.

$$\begin{array}{r}
 4 : 4 :: 218 : 9 \\
 12 \\
 84 \\
 84 \overline{) 10500} \\
 84 \\
 210 \\
 168 \\
 420 \\
 420
 \end{array}$$

continued

26. If $\$292$ dollars $32\frac{1}{2}$ cents
are paid for 4176 acres 3 roods
 28 perches of land. how much
is it per acre:

C A R D D C A
 1146-3-28: 11292325:: 1
 1404 1604
 1904 2545395004
 110 4292325 110
 46308 68677200 150
 686772 900
 00

27. If a man's annual income be 1333 dollars, and he expend daily 2 dollars and 14 cents, how much will he save at the end of the year.
Ans. 551 doll's. 90 cts.

$$\begin{array}{r}
 1233.00 \\
 781.10 \\
 \hline
 551.90
 \end{array}$$

28. If 321 bushels of wheat cost
\$40 dollars 75 cents. what is it
per bushel: Ans. 75 cts.

$$\begin{array}{r} \text{Bu} \quad \quad \quad \text{FC} \quad \quad \quad \text{Bu} \\ 321 : 24075 :: 1 \\ 75 \overline{) 321} \quad \overline{) 24075} \quad (75 \\ 1605 \quad \quad \quad 2247 \\ \hline 2247 \quad \quad \quad 1605 \\ \hline 24075 \quad \quad \quad 1605 \end{array}$$

29 If $1\frac{1}{2}$ yard of cloth cost 2 dollars
50 cents. what will 1 quarter 2 na
ils come to: Ans. 62 $\frac{1}{2}$ cts.

$$\begin{array}{r} 1\frac{1}{2} : 250 :: 1.2 \\ \hline 6 \end{array}$$

$$\begin{array}{r} 6 \\ \hline 1500 \end{array}$$

$$\begin{array}{r} 1.2 \\ \hline 6 \end{array}$$

$$\begin{array}{r} 24 \overline{) 1500} \quad (62\frac{1}{2}) \\ \underline{144} \\ 60 \\ \underline{48} \\ 12 \end{array}$$

30. Bought 3 pipes of wine containing $120\frac{1}{2}$,
 $124\frac{1}{2}$, and $126\frac{3}{4}$ gallons, at 5s. 6d. per
gallon: what do they cost:
Ans. 102 l. 15. 10 $\frac{1}{2}$ d.

[illegible]

Of The Single Rule
The Single Rule

31. A sets out from a certain place and goes 12 miles a day: 5 days after B sets out from the same place, the same way, and goes 16 miles a day; in how many days will he overtake A? Ans. 15 days.

$$\begin{array}{r}
 M \quad D \quad M \\
 H : 1 : : 06 \\
 \hline
 60 \\
 \hline
 15
 \end{array}$$

32. If I have owing to me 1000*l*.
and compound with my debtor at
12*s*. 6*d*. per pound. How much must
I receive? Ans. 625*l*.

we get Ans. 625¢:

$$\begin{array}{r} \text{L} \quad \text{W} \quad \text{P} \quad \text{L} \\ 1 : 12 : 6 :: 1000 \\ \hline 12 \\ 150 \end{array}$$

$$\begin{array}{r} 12 \overline{) 150000} \\ 240 \\ \hline 12000 \\ 24000 \\ \hline 62500 \end{array}$$

33. if 365 men consume 45 Carrels
of pork in 9 months. how many will
500 men consume in the same
time? Ans. $102\frac{54}{73}$ Carrels.

Men. Harls
 865 : 45 500
 365 37500 102
 365
 1000
 430
 270 54
 365 43

34. How much land at 2 dollars 50 cents per acre, must be given in exchange for 360 acres, at 3 dollars 75 cents? Ans. 540 acres.

$250 : 360 :: 375$
 $\frac{360}{22500}$
 1125
 $250 \overline{) 135000} (540$
 $\underline{1250}$
 1000
 $\underline{1000}$
 0

35. If the earth, which is 860 degrees in circumference, turns round on its axis in 24 hours, how far are the inhabitants at the equator carried in one minute, a degree there being $69\frac{1}{2}$ miles?

Ans. 14 mil
26 Deg
24 : 850 :: 1
60 : 69.5
1440 1800
3240
2160
1440 250200 (17.3
1440
10620
10080
540
8
1440 43203
4320

K

5. If 5 dollars is paid for the carriage of 1 cwt. weight 150 miles. how far may 6 cwt. weight be carried for the same money?

Ans. 25 miles.

2 If 60 men can build a bridge in 100 days, how long will it require 20 men to build it:

Ans 300 days.

c. If a street 30 feet wide and 300 yards long can be paved by 40 men in 20 days, what length will one of 60 feet wide, be paved by the same men in the same time: $\frac{300 \times 30 \times 40}{60 \times 40} = 150$ yards

3. If a wall 100 yards long requires 65 men 11 days. in what time would 5 men complete it?

Ans. 52 days.

4. Späfeld that is 80 rods wide and 80 in length contain 15 acres. how wide must one be. to contain the same quantity. that is but 40 rods long.

ms. 346. 4 ft. 8 $\frac{1}{2}$ in.

length R length
50 : 30 :: 70

4. if a barrel of flour will last a family
of 6 persons 24 days. how long would it
last if 3 more were added to the
family? Ans. 16 days.

Persons 74 Persons
6 : 24 :: 9
6

$$\begin{array}{r} 80 \overline{) 2400} \text{ (H...H...S)} \\ \underline{210} \\ 300 \\ \underline{280} \\ 20 \\ \underline{16} \text{ H} \\ 300 \\ \underline{10} \\ 330 \text{ H} \\ \underline{280} \\ 50 \\ \underline{40} \\ 100 \\ \underline{80} \text{ S} \\ 200 \\ \underline{160} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

Single Rule of Three

8. A board is .75 of a foot wide. what length must it be to measure 12 square feet: Ans. 16 feet.

$$\begin{array}{r} \text{ft} \quad \text{ft} \quad \text{ft} \\ 1 : 12 :: .75 \\ .75 \overline{) 12.00} 16 \\ \underline{75} \\ 450 \\ \underline{450} \end{array}$$

9. How much cloth 125 quarters wide can be lined by 12.5 yards of silk that is .45 of a yard wide:

Ans. 25.5 yards.

$$\begin{array}{r} \text{qrs} \quad \text{yds} \quad \text{qr} \\ .45 : 12.5 :: 125 \\ 42.5 \\ \underline{345} \\ 80 \\ 1,250 \overline{) 31545} 25.5 \\ \underline{2500} \\ 6545 \\ \underline{6250} \\ 2950 \\ \underline{2950} \end{array}$$

10. If 10 men could complete a building in 4.5 months. what time would it require if 5 more were employed: Ans. 3 months.

$$\begin{array}{r} \text{men} \quad \text{men} \quad \text{men} \\ 10 : 4.5 :: 15 \\ 15 \overline{) 45.0} 3 \\ \underline{45} \end{array}$$

11. In what time will 600 dollars gain 50 dollars. when 300 dollars would gain it in 15 years: Ans. 2 years.

$$\begin{array}{r} \text{dollars} \quad \text{years} \\ 300 : 15 :: 600 \\ 80 \\ 600 \overline{) 1200} 2 \text{ years} \\ \underline{1200} \end{array}$$

12. If a traveller can perform a journey in 11 days. when the days are 12 hours long. what time will he require when the days are 16 hours long: Ans. 3 days.

$$\begin{array}{r} \text{h} \quad \text{D} \quad \text{h} \\ 12 : 11 :: 16 \\ 16 \\ 16 \overline{) 48} 3 \text{ days} \\ \underline{48} \end{array}$$

13. Suppose 100 men in a garrison are supplied with provisions for 30 days. how many men must be sent out if they would have the provisions last 50 days: Ans. 160 men.

$$\begin{array}{r} \text{D} \quad \text{M} \quad \text{D} \\ 30 : 100 :: 50 \\ 100 \\ 50 \overline{) 15000} 240 \\ \underline{100} \\ 5000 \\ \underline{2000} \\ 3000 \\ \underline{3000} \end{array} \quad \begin{array}{r} 100 \\ 240 \\ \hline 160 \text{ men} \end{array}$$

Single Rule of Three Simple

14. Lent a friend 292 dollars per 6 months: afterwards I borrow from him 506 dollars: how long may I keep it to balance the favor?
Ans. 2 months 5 days.

$$\begin{array}{r} 292 : 6 :: 506 \\ 800 \overline{) 1452} \quad (2 \text{ months} \\ \underline{1160} \\ 292 \end{array}$$

$$\begin{array}{r} 800 \overline{) 11600} \quad (5 \text{ days} \\ \underline{11000} \\ 600 \\ 2 \overline{) 1200} = 600 \end{array}$$

15. 1200 men stationed in a garrison have provisions for 9 months at the rate of 10 ounces per day: how long at the same allowance will the same provisions last if they are reinforced by 400 men: And also what diminution must be made on each ration, that the provisions may last for the same time: *Ans. 6 $\frac{3}{4}$ months at the same allowance - 3 $\frac{1}{2}$ oz. deduction to last for the same time.*

$$\begin{array}{r} \text{Men} \quad \text{Mo} \quad \text{Men} \\ 1200 : 9 :: 1600 \\ 1600 \overline{) 10800} \quad (6 \frac{3}{4} \text{ Months} \\ \underline{9600} \\ 1200 \\ 4 \overline{) 1200} = 300 \\ \text{Men} \quad \text{oz} \quad \text{Men} \\ 1200 : 14 :: 1600 \\ 1600 \overline{) 16800} \quad (10 \frac{1}{2} \\ \underline{1600} \\ 800 \\ 8 \overline{) 1600} = 200 \end{array}$$

16. If a piece of land 100 rods in length and 10 in breadth, make an acre: how wide must it be if it is but 25 rods long: *Ans. 4 $\frac{2}{5}$ rods.*

$$\begin{array}{r} R \quad R \quad R \\ 10 : 100 :: 25 \\ 25 \overline{) 1000} \quad (40 \text{ rods} \\ \underline{1000} \\ 0 \end{array}$$

17. How much in length that is 3 inches is broad, will make a square foot: *Ans. 48 inches.*

$$\begin{array}{r} \text{in} \quad \text{in} \quad \text{in} \\ 12 : 12 :: 3 \\ 12 \overline{) 144} = 48 \text{ in} \end{array}$$

18. If a pasture field will feed 60 cows 91 days: how long will it feed 20 cows: *Ans. 26 days.*

$$\begin{array}{r} \text{cows} \quad \text{days} \quad \text{cows} \\ 60 : 91 :: 20 \\ 21 \overline{) 546} \quad (26 \\ \underline{420} \\ 126 \end{array}$$

19. There is a cistern having 1 pipe, which will empty it in 10 hours; how many pipes of the same capacity will empty it in 24 minutes: *Ans. 25 pipes.*

$$\begin{array}{r} H \quad P \quad Mi \\ 10 : 1 :: 24 \\ 60 \\ 60 \overline{) 2400} \quad (25 \\ \underline{2400} \\ 0 \end{array}$$

Sinle Rule of Three Inven

20. How many yards of carpeting that is half a yard wide. will cover a floor that is 30 feet long and 18 feet wide: Ans. 120 yds.

$$\begin{array}{ccc} \text{ft} & \text{ft} & \text{ft} \\ 300 & : 18 & :: 1.5 \end{array}$$

$$\begin{array}{r} 1.5 \overline{) 5400} \quad 360 \\ \underline{45} \\ 90 \\ \underline{90} \\ 0 \end{array} \quad \text{120 yards Ans}$$

$$\begin{array}{ccc} A & B & C \\ 100 & : 5 & :: 25 \end{array}$$

22

$$\begin{array}{ccc} A & B & C \\ 20 & : 25 & :: 1 \end{array}$$

20 days

500 miles

21. What is the weight of a pea To a steel yard, which being suspended 39 inches from the centre of motion. will equilibrate 208 lb. suspended at the draught end $\frac{3}{4}$ of an inch: Ans. 146 lb.

$$\begin{array}{ccc} \text{in} & \text{lb} & \text{in} \\ 39 & : 208 & :: 39 \end{array}$$

$$\begin{array}{r} 390 \overline{) 15600} \\ \underline{15600} \\ 0 \end{array}$$

22. A and B depart from the same place. and travel the same road: but A goes 5 days before B at the rate of 20 miles a day. B follows at the rate of 25 miles a day: in what time. and at what distance will he overtake A:

Ans. 20 days. and 500 miles.

James. McCormick

Single Rule of Three, Simple

General Rule.

1. If 30 horses plough 12 acres, how many will 40 horses plough in the same time:

$$\begin{array}{r} h \quad h \quad \text{acr} \\ 30 : 40 :: 12 \\ \hline 30 \overline{) 480} \quad (16 \text{ acres. Ans} \\ \underline{30} \\ 180 \\ \underline{180} \\ 0 \end{array}$$

$$\begin{array}{r} \text{gal} \quad \text{gal} \quad \text{I} \\ \text{lost} \quad 63 : 1 :: 119 \\ \underline{54} \quad \quad \quad \underline{12} \text{ gain} \\ \quad \quad \quad 131 \\ \quad \quad \quad \underline{1} \\ 54 \overline{) 131} \quad (2.425 \\ \underline{108} \\ 230 \\ \underline{216} \\ 140 \\ \underline{108} \\ 320 \\ \underline{270} \\ 50 \end{array}$$

2. If 30 horses plough 12 acres in 10 days; in how many days will 40 horses plough the same quantity:

Operation.

$$\begin{array}{r} h \quad h \quad \text{D} \\ 30 : 40 :: 10 \\ \hline 40 \overline{) 300} \quad (7.5 \text{ days. Ans.} \\ \underline{280} \\ 200 \\ \underline{200} \\ 0 \end{array}$$

5. If 225 pounds be carried 512 miles for 20 dollars, how many pounds may be carried 4 miles for the same money: Ans. 18000 lb.

$$\begin{array}{r} lb \quad lb \quad \text{d} \\ 64 : 512 :: 225 \\ \hline 512 \\ \underline{450} \\ 625 \\ 1125 \\ 64 \overline{) 11520} \quad (1800 \\ \underline{64} \\ 512 \\ \underline{512} \\ 0 \end{array}$$

3. If 800 soldiers in a garrison have provisions sufficient for 2 months, how many must depart, that the provisions may last them for 5 months: Ans. 480

$$\begin{array}{r} \text{sold} \quad \text{sold} \quad \text{gal} \\ 5 : 2 :: 800 \\ \hline 5 \overline{) 1600} \quad \quad \quad \underline{800} \\ \underline{800} \quad \quad \quad \underline{800} \\ 0 \end{array}$$

6. If 8 dollars 5 cents be assessed on 1750 dolls. what is the tax of 10 dollars at the same rate:

Ans. 50 cents.

$$\begin{array}{r} \text{I} \quad \text{d} \quad \text{c} \quad \text{I} \\ 1750 : 87,50 :: 10 \\ \hline 1750 \overline{) 87500} \quad (50 \\ \underline{8750} \\ 0 \end{array}$$

4. Bought a hogshead of Madeira wine for 119 dollars, nine gallons of which leaked out, what was the remainder sold at per gallon, to gain 12 dollars on the whole: Ans. 2 dollars. 42 1/2 cts.

25

225

The Simple Rule of Three

1. If 6 men in 8 days earn 100 dollars. how much will 12 men earn in 24 days:

$$\begin{array}{r} 288 \\ 100 \\ 600 \overline{) 28800} \end{array}$$

$$\begin{array}{l} 6 \text{ men} \\ 8 \text{ days} \end{array} : 100 :: \begin{array}{l} 12 \text{ men} \\ 24 \text{ days} \end{array}$$

$$\begin{array}{r} 288 \\ 100 \\ 28 \overline{) 28800} \end{array} \begin{array}{l} 600 \text{ dolls. Ans} \\ 00 \end{array}$$

2. If 10 bushels of oats suffice 18 horses for 20 days. how many bushels will serve 60 horses 36 days: Ans. 60 bushels.

$$\begin{array}{r} 18 \text{ horses} \\ 20 \text{ days} \end{array} : 10 :: \begin{array}{l} 60 \text{ horses} \\ 36 \text{ days} \end{array}$$

$$\begin{array}{r} 360 \\ 180 \\ 2160 \\ 360 \overline{) 21600} \end{array} \begin{array}{l} 60 \text{ bushels} \\ 0 \end{array}$$

3. If 56 pounds of bread will suffice 7 men 14 days. how much bread will serve 21 men 3 days: Ans. 36 pounds.

$$\begin{array}{r} 7 \text{ men} \\ 14 \text{ days} \end{array} : 56 :: \begin{array}{l} 21 \text{ men} \\ 3 \text{ days} \end{array}$$

$$\begin{array}{r} 28 \\ 7 \\ 98 \\ 95 \overline{) 3528} \end{array} \begin{array}{l} 63 \\ 56 \\ 315 \\ 36 \text{ pounds} \\ 0 \end{array}$$

Single Rule of Three

4. If 8 students spend 384 dollars in 6 months. how much will maintain 12 students 10 months:

Ans. 960 dollars.

$$\begin{array}{r}
 \text{8 students} \\
 \text{6 months} : 384 :: \text{12 students} \\
 \text{10 months} \\
 \hline
 120 \\
 384 \\
 \hline
 480 \\
 960 \\
 \hline
 360 \\
 48 \overline{) 46080} \quad (960 \text{ dolls} \\
 \underline{432} \\
 288 \\
 \underline{288} \\
 0
 \end{array}$$

6. If 14 dollars interest is gained by 400 dollars in 6 months. what will be the interest of 400 dollars for 5 years:

Ans. 80 dollars.

$$\begin{array}{r}
 \text{400 dollars} \\
 \text{6 months} : 14 :: \text{400 dollars} \\
 \text{5 years} \\
 \hline
 60 \\
 24000 \\
 14 \\
 \hline
 96000 \\
 24000 \\
 \hline
 4200 \overline{) 336000} \quad (80 \text{ dolla} \\
 \underline{33600} \\
 0
 \end{array}$$

5. If 20 hundred weight is carried 50 miles for 25 dollars. how much must be given for the carriage of 40 hundred weight 100 miles:

Ans. 100 dollars.

$$\begin{array}{r}
 \text{20 hundred} \\
 \text{50 miles} : 25 :: \text{40 hundred} \\
 \text{100 miles} \\
 \hline
 4000 \\
 25 \\
 \hline
 20000 \\
 8000 \\
 \hline
 1000 \overline{) 100000} \quad (100 \\
 \underline{1000} \\
 00
 \end{array}$$

7. If 4 men can do 12 rods of ditching in 6 days. how many rods may be done by 8 men in 24 days: Ans. 96 rods.

$$\begin{array}{r}
 \text{4 men} \\
 \text{6 days} : 12 :: \text{8 men} \\
 \text{24 days} \\
 \hline
 132 \\
 16 \\
 \hline
 192 \\
 12 \\
 \hline
 24 \overline{) 2304} \quad (96 \text{ rods.} \\
 \underline{216} \\
 144 \\
 \underline{144} \\
 0
 \end{array}$$

Simple Rule of Three

Inverse Proportion. }

1. If 4 dollars pay 8 men for 3 days: how many days must 20 men work for 40 dollars:

$$\begin{array}{l} 4 \text{ dollars } \{ \text{days} \\ 8 \text{ men} \} : 3 :: \{ 40 \text{ dollars} \\ 20 \text{ men} \} \end{array}$$

$$\begin{array}{r} 40 \\ 4 \overline{) 160} \\ 160 \\ \hline 0 \end{array}$$

3. If 4 men are paid 24 dollars for 3 days work, how many men may be employed 16 days for 96 dollars: Ans. 3 men.

$$\begin{array}{l} 3 \text{ days } \{ \text{men} \\ 4 \text{ dollars} \} : 4 :: \{ 16 \text{ days} \\ 96 \text{ dollars} \} \end{array}$$

$$\begin{array}{r} 144 \\ 4 \overline{) 576} \\ 576 \\ \hline 0 \end{array}$$

1. Here the lower line is inverse, which transposed will stand thus.

$$\begin{array}{l} 4 \text{ dollars } \{ \text{days} \\ 20 \text{ men} \} : 3 :: \{ 40 \text{ dollars} \\ 8 \text{ men} \} \end{array}$$

$$\begin{array}{r} 80 \\ 40 \overline{) 960} \\ 960 \\ \hline 0 \end{array}$$

4. If 4 men can reap 8 acres of grain in 12 days, how many men can reap 100 acres in 5 days: Ans. 20 men.

$$\begin{array}{l} 8 \text{ acres } \{ \text{men} \\ 12 \text{ days} \} : 4 :: \{ 100 \text{ acres} \\ 5 \text{ days} \} \end{array}$$

$$\begin{array}{r} 420 \\ 420 \overline{) 8400} \\ 8400 \\ \hline 0 \end{array}$$

2. If 4 men are paid 24 dollars for 3 days work, how many days may 16 men be employed for 384 dollars: Ans. 12 days.

$$\begin{array}{l} 4 \text{ men } \{ \text{days} \\ 24 \text{ dollars} \} : 3 :: \{ 384 \text{ dollars} \\ 16 \text{ men} \} \end{array}$$

$$\begin{array}{r} 1536 \\ 384 \overline{) 4608} \\ 4608 \\ \hline 0 \end{array}$$

5. If 4 men can reap 8 acres of grain in 12 days, how many days will it require 20 men to reap 100 acres: Ans. 5 days.

$$\begin{array}{l} 4 \text{ men } \{ \text{days} \\ 8 \text{ acres} \} : 12 :: \{ 100 \text{ acres} \\ 20 \text{ men} \} \end{array}$$

$$\begin{array}{r} 700 \\ 1680 \overline{) 8400} \\ 8400 \\ \hline 0 \end{array}$$

f. sm

Scotch Bill of Math

6. If no cents are paid for the carriage of 200 pounds for 40 miles, how far may 20200 pounds be carried for 60 dollars 60 cents:

Ans. 60 miles.

40 cents 2 miles 6060 cents
200 pounds } 40 :: 20200 pounds

40
20200
8000
800
80
808000

6060
200
1212000
40
48480000
48480000
60

7. If 5 men spent 200 dollars in 22 weeks and 8 days, how long will 300 dollars support 12 men:

Ans. 14 weeks 2 days.

5 men 22 8 days 12 men
200 dollars } 22:6::300 dollars
12
2400

5
1500
160
80000
1500
2400000
2400
100
14=2
00

Promiscuous Questions

1. If 12 oxen in 8 days eat 10 acres of clover, how many acres will serve 24 oxen 18 days

Ans. 120 acres

12 oxen 2 acres 24 oxen
8 days } 10 :: 28 days

96
192
96
11520
96
11520
120
192
1920

2. A person having engaged to remove 8000 weight 15 miles in 9 days; with 18 horses. in 6 days, he removed 4500 weight: how many horses will be necessary to remove the rest, in the remaining 3 days:

Ans. 28 horses

8000
4500
3500
18 horses 3 days 28 horses
6 } 18::3 days

3
13500
21000
18
13500
27000
108000
108000

Continued R S

3. If the carriage of 9 hogheads of sugar, each weighing 12 cwt. for 60 miles cost 100 dollars, what must be paid for the carriage of 50 barrels of sugar, each weighing 2.5 cwt. 300 miles: *Ans.* 578 dolls. 70 + cents.

| | | |
|----------|---------|---------|
| 12 | 50 | |
| 9 | 2.5 | |
| cwt. 108 | 125.0 | dollars |
| miles 60 | 300 | miles |
| : 100 :: | | |
| 6480 | 3750000 | |
| | 32400 | |
| | 51000 | |
| | 45360 | |
| | 56400 | |
| | 51840 | |
| | 45600 | |
| | 45360 | |
| | 2400 | |

4. If a cellar which is 22.5 feet long, 17.3 feet wide, and 10.25 deep is dug by 6 men in 2.5 days, working 12.3 hours each day; how many days of 8.2 hours will it require 9 men to dig one, which is 45 feet long, 34.6 wide and 12.3 deep: *Ans.* 12 days:

| | |
|--------------|--------------|
| 22.5 length | 45 length |
| 17.3 breadth | 34.6 breadth |
| 675 | 270 |
| 1675 | 180 |
| 225 | 135 |
| 389.25 | 1557.0 |
| 10.25 depth | 12.3 depth |
| 1946.25 | 46710 |
| 77850 | 31140 |
| 389250 | 15570 |
| 3959.5125 | 19151.10 |
| men 6 | 9 men |
| hours 12.3 | 8.2 hours |
| 23938.8750 | 17235990 |
| 12.3 | 8.2 |
| 718166250 | 344271980 |
| 478444500 | 134887920 |
| 239388750 | 1413351180 |
| 294448.16250 | 2.5 |
| | 7066755400 |
| | 28267023600 |
| | 353837795000 |
| | 29444816250 |
| | 58884682500 |
| | 58889632500 |

12 days

Practice

James Merrick
September the 21 day 1822

Examples.

1. What will 175 pounds of tea come to at 1 dollar 30 cents and 5 mills per pound.

| | | |
|----------|----------------------|----------|
| 130.5 | cts. | 175 |
| 175 | | |
| 6525 | Or. 25 $\frac{1}{4}$ | 4375 |
| 9135 | 5 $\frac{1}{5}$ | 875 |
| 305 | 5m $\frac{1}{10}$ | 875 |
| 228,37.5 | | 228,37.5 |

228 37.5 Ans. 228 dolls. 37 cts. 5 mills

yards

| | |
|-------------------------|-------|
| 625 | Ans 6 |
| 25 $\frac{1}{4}$ 156,25 | |

yards

| | |
|-------------------------|------|
| 8275 | |
| 11 $\frac{1}{25}$ 331 | |
| 11m $\frac{1}{10}$ 3310 | Ans. |
| 364,10 | |

yards

| | |
|------------|-----|
| 8275 | Ans |
| 5m 200 800 | |
| 275 | |
| 200 | |
| 750 | |
| 600 | |
| 1500 | |
| 1400 | |
| 1000 | |
| 1000 | |

250

| | | |
|----|---------------|------------|
| 50 | $\frac{1}{2}$ | 250 |
| 25 | $\frac{1}{2}$ | 125 |
| 75 | $\frac{1}{2}$ | 6250 |
| | | 437,50 Ans |

201

| | | |
|----|---------------|------------|
| 20 | $\frac{1}{5}$ | 804 |
| | | 4020 |
| | | 844,20 Ans |

yards

| | |
|------------------------|-------------|
| 2210 | |
| 10 $\frac{1}{10}$ 2210 | |
| | 22100 |
| | 2431,00 Ans |

yards

| | |
|----------------------|---------------|
| 421 | |
| 20 $\frac{1}{5}$ 842 | |
| 20 $\frac{1}{5}$ 842 | |
| 1 $\frac{1}{20}$ 842 | |
| 5m $\frac{1}{2}$ 421 | |
| | 2105 |
| | 1016,71.5 Ans |

1. What will 375 yards of muslin cost at $\frac{3}{4}$ of a dollar per yard:

375 at $\frac{3}{4}$

| | |
|---------|-------------|
| 3 | |
| 4) 1125 | |
| | 281.25 Ans. |

P. Practice R

$$\begin{array}{r}
 2 \text{ cwt } 11 \text{ qr } 14 \text{ lb } \frac{1}{4} \\
 \underline{4} \\
 18 \\
 \underline{28} \\
 140 \\
 \underline{35} \\
 4)490 \\
 \underline{12250} \text{ Ans}
 \end{array}$$

Application

1. Bought 6 hogheads of tobacco each weighing 125 cwt. at $\frac{2}{3}$ of a dollar per pound: what did it cost: Ans. 3150 dolls.

$$\begin{array}{r}
 3 \text{ cwt } 12 \text{ qr } 13 \text{ lb } \frac{2}{4} \\
 \underline{4} \\
 50 \\
 \underline{28} \\
 413 \\
 \underline{100} \\
 1413 \\
 \underline{2} \\
 3)2826 \\
 \underline{942}
 \end{array}$$

$$\begin{array}{r}
 \text{hd} \quad \text{cwt} \quad \text{dollar} \\
 6 \quad 12.5 \quad \frac{2}{3} \\
 \underline{6} \\
 75.0 \\
 \underline{4} \\
 300 \\
 \underline{28} \\
 2400 \\
 \underline{600} \\
 8400 \\
 8)25200 \\
 \underline{3150}
 \end{array}$$

$$\begin{array}{r}
 4 \text{ cwt } 14 \text{ qr } 2 \text{ lb } \frac{7}{8} \\
 \underline{4} \\
 58 \\
 \underline{28} \\
 471 \\
 \underline{116} \\
 5)1631 \\
 \underline{3262} \\
 5)22534 \\
 \underline{28512.5}
 \end{array}$$

2. A gentleman bought a vessel of 60 tons burden. and gave at the rate of $2\frac{3}{5}$ eagles per ton: what did the vessel cost: Ans. 1560 dolls.

$$\begin{array}{r}
 \text{d} \quad \text{eagles} \\
 6 \quad 2\frac{3}{5} \\
 \underline{2} \\
 120 \\
 \underline{36} \\
 156 \\
 \underline{10} \\
 1560
 \end{array}$$

$$\begin{array}{r}
 60 \\
 \underline{3} \\
 5)180 \\
 \underline{36}
 \end{array}$$

Practi Practi

3. A carpenter bought 12650 feet of boards at $10\frac{3}{4}$ dollars per thousand: what did they cost him: Ans. 134dolls. 56cts. $8\frac{1}{2}$

$$\begin{array}{r}
 12650 \\
 \times 88550 \\
 \hline
 1106845
 \end{array}$$

96
 1341
 5
 191 1/4 6405
 335 25
 70, 110, 25 1/2 ms

Example

1. Bought 16 cwt. 1 gr. 16 lb. of
black coat 12 dollars 50 cents
per hundred weight: what did
it cost

| | | | | |
|-------|---|---------|--|--|
| | | 1244 | | |
| | | 16 | | |
| | | 7464 | | |
| | | 1244 | | |
| 14.00 | 1 | 9904 | | |
| 16.00 | 4 | 311 | | |
| | | 14444 | | |
| | | 2639274 | | |
| | | 2 | | |

92.00 dollars

11. 10wt. cys. 19lb. of sugar
at 15 dolls. 5 mills per hund
red weight. Ans. 10 dolls. 58cts.

| | | |
|-----|--------|------|
| 042 | 10 | 5835 |
| 166 | 21 | 4857 |
| 2 | 26 | 7941 |
| 1 | 13 | 3977 |
| | 107,58 | 048 |

2. 17 cwt. 3 qtr. 19 lb. of sugar at
10 dollars 94 cents per hundred
weight. Ans. 196 dolls. 41 cts.

[illegible]

Practice

1. hat will 1548 yards come to at 1s. 6d. per yard:

or 6d. $\frac{1}{2}$ 1548 at 1 shilling will be the same number of shillings.
 $20 \overline{) 6822}$ shillings
 $34112 = 909$ dolls. 60cts.

2. 1475 yards at 6s. 8d. Ans. 159 13 11 = 420 11 1/4

yards
 1475
 $6 \overline{) 2535}$
 $2 \overline{) 2360}$ 6
 780
 $20 \overline{) 3153}$ 11
 1576 13 11
 3153
 12
 $90 \overline{) 37840}$
 $4201111 \frac{1}{4}$

3. 3399 do. 3s. 4d. Ans. 66 3 11 =

yards
 3399
 $4 \overline{) 1191}$
 1320 11
 $20 \overline{) 1323}$ 11
 6603 11

4. 159 1/4 lb. of coffee at 18s 5 5 =

coffee
 159 1/4
 $6 \overline{) 1593}$
 26 11 6 1/2
 $20 \overline{) 2615}$ 5
 1305 5

5. lb
 658
 12
 $20 \overline{) 4896}$
 394 16 0 =

6. 1/2 5 yds of cloth at 16s Ans 596 0 0 =

yds
 745
 16
 4480
 745
 $20 \overline{) 11920}$
 59600 0 =

7. 969 do. 14 11 Ans 964 19 3 =

do
 969
 19
 8721
 969
 $6 \overline{) 18411}$
 $3 \overline{) 18411}$ 6
 $2 \overline{) 242}$ 3
 161 6
 $20 \overline{) 19294}$ 3
 964193 =

Pencil James Hermick

8. 3715 $\frac{1}{2}$ Do 1 $\frac{1}{2}$ =

Do

$$\begin{array}{r} 3715 \\ 1 \frac{1}{2} \overline{) 3715} \\ \underline{15} \\ 22 \\ \underline{15} \\ 7 \\ \underline{6} \\ 1 \end{array}$$

9. 4567 do. 19 $11\frac{1}{2}$ Ans 4557 9 $8\frac{1}{2}$ =

Do

$$\begin{array}{r} 4567 \\ 19 \overline{) 4567} \\ \underline{152} \\ 304 \\ \underline{171} \\ 135 \\ \underline{114} \\ 21 \end{array}$$

11 $\frac{1}{2}$ (20) 9114 (9 $8\frac{1}{2}$ = Ans

$$\begin{array}{r} 9114 \\ 11 \frac{1}{2} \overline{) 9114} \\ \underline{20} \\ 71 \\ \underline{22} \\ 49 \\ \underline{45} \\ 4 \end{array}$$

Examples

1 What will 45 cwt. 2 qrs. 14 lb. of sugar come to at 36 $\frac{1}{2}$ p. per hundred weight?

$$\begin{array}{r} 36 \frac{1}{2} \\ 45 \times 9 = 405 \end{array}$$

$$\begin{array}{r} 29 \frac{1}{2} \\ 14 \frac{1}{2} \overline{) 152} \\ \underline{14} \\ 12 \\ \underline{11} \\ 1 \end{array}$$

2. 37 $\frac{1}{2}$ 14 cwt. 2 qrs. 14 lb. of hemp at 89 l. 6 s. 8 d. per ton.

Ans. 3370 l. 13 s. 2 d.

$$\begin{array}{r} 89 \ 6 \ 8 \\ 3 \times 12 = 37 \end{array}$$

$$\begin{array}{r} 3216 \ 0 \ 0 \\ 89 \ 6 \ 8 \end{array}$$

3370 = 13 = 2 Ans

3. 3 $\frac{1}{2}$ 12 cwt. 3 qrs. 27 lb. of sugar at 8 l. 11 s. 5 d. per cwt.

Ans. 625 l. 11 s. 10 d.

$$\begin{array}{r} 8 \ 11 \ 5 \\ 6 \times 12 = 72 \end{array}$$

$$\begin{array}{r} 61 \ 4 \ 2 \\ 12 \ 2 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \end{array}$$

625 11 = 10 Ans

Practica

Handwritten scribbles and numbers

11. 7t. 4wt. 2gr. 21lb. of rice at
36. 17s. 6d. per cwt.

Ans. 560l. 13s. 3d.

Handwritten calculations

$$\begin{array}{r} 3 \ 17 \ 6 \\ 12 \times 12 = 144 \end{array}$$

Handwritten calculations

$$\begin{array}{r} 46 \ 10 \ 0 \\ 12 \\ \hline 2 \ 14 \ 12 \\ 14 \ 12 \\ 7 \ 12 \end{array}$$

560 = 13 = 3 $\frac{1}{4}$

5. 476 acres 3 roods 28 perches of land
at 36. 7s. 11d. per acre.

Ans. 1619l. 11s. 13d.

Handwritten calculations

$$\begin{array}{r} 3 \ 19 \ 11 \\ 11 \times 11 = 121 \\ 33 \ 19 \ 11 \\ 13 \ 38 \ 11 \\ 23 \ 7 \ 11 \\ 20 \ 7 \ 11 \\ 15 \ 16 \ 11 \\ 1 \ 13 \ 11 \\ 0 \ 16 \ 11 \\ 0 \ 8 \ 11 \\ 0 \ 3 \ 11 \end{array}$$

1619 = 11 = 1 $\frac{3}{4}$

6. 640 acres 2 roods perches at
10 dollars 50 cents per acre

Ans. 6458dolls. 59 $\frac{1}{2}$ cts.

Handwritten calculations

$$\begin{array}{r} 1055 \times 10 = 640 \\ 10550 \times 4 \\ \hline 105500 \\ 6 \\ \hline 633000 \\ 42200 \\ \hline 2 \ 16 \ 45 \ 100 \\ 5275 \\ 20 \ 13 \ 18 \ 75 \\ \hline 6458 \ 59.3.45 \end{array}$$

7. 229 acres 3 roods 18 perches at
18 dollars 50 cents per acre.

Ans. 4252dolls. 45 $\frac{1}{2}$ cts

Handwritten calculations

$$\begin{array}{r} 1850 \times 9 \\ 10 = 229 \\ 18500 \times 2 \\ 10 \\ \hline 185000 \\ 2 \\ \hline 370000 \\ 37000 \\ 16650 \\ \hline 2 \ 42 \ 36 \ 50 \\ 925 \\ 10 \ 46 \ 25 \\ 8 \ 11 \ 56 \ 25 \\ 925 \\ \hline 4252 \ 45.6.25 \end{array}$$

Section 2. 33

12 lb. tare 14 lb. per cent:

$$\begin{array}{r} 28 \overline{) 180} \left(\begin{array}{l} 6 \\ 1 = 2 = 12 \end{array} \right. \\ \underline{168} \\ 12 \end{array}$$

| | | |
|-----|---|-----------|
| 212 | 1 | 7500 |
| | 2 | 625 |
| | 3 | 29288 |
| 8 | 4 | 2321 |
| | 5 | 11605 |
| 2 | 6 | 8247.7665 |
| 1 | 7 | |

$$\begin{array}{r}
 44 \\
 \hline
 60 \\
 28 \\
 \hline
 481 \\
 121 \\
 \hline
 1691 \\
 45 \\
 \hline
 8455 \\
 6764 \\
 \hline
 960,95
 \end{array}$$

$$\begin{array}{r} 59 = 1 - 24 \\ 9 \quad 0 \quad 2 \\ \hline 50 = 1 - 22 \\ 16 \\ \hline 300 \\ 50 \\ \hline 800 \end{array}$$

| | | |
|-----|---|---------|
| 901 | 1 | 800 |
| 141 | 1 | 4 |
| 14 | 2 | 2 |
| 4 | 2 | 0142 |
| 1 | 4 | 804,142 |

5. Sold 24 bags of coffee, each 2 cwt. 3 qr. 14 lb. gross. tare 13 lb. per cwt. tree. 1/4 per 10 lb. what is the neat weight and what will it come to at 32 cents per pound.

Ans. 66 cwt. 2 qr. 11 lb. and comes to \$238.68

cwt qr lb
 24 = 1 = 11
 9 0 10
 69 1 1
 4
 274
 28
 2214
 554
 26 775 7 28 11
 52 298 10
 255 28 2=2
 234 18
 217
 208
 19

cwt qr lb
 69 21 11
 2 2 18
 66 2 11

cwt qr lb
 2 3 14
 9+3=24
 26 0 13
 3
 48 1 11
 13
 234
 78
 101 11
 3 25
 0 8 125
 0 4 6 428
 28 1018 36
 84 2=0=10
 178
 168
 10

cwt qr lb
 66 2 11

266
 28
 2129
 533
 4459
 32
 14918
 223778
 2386188

James M. Carnick
 P. S. S.

Simple Interest

CA. 11

1. What is the interest of 154 dollars for 1 year. at 6 percent: Ans. 27dolls. 24cts.

$$\begin{array}{r} 154 \\ 6 \\ \hline 27,24 \text{ Ans} \end{array}$$

2. Required the interest of the same sum for 5 years. at the same rate Ans. 136dolls. 20cts.

$$\begin{array}{r} 154 \\ 6 \\ \hline 2724 \\ 5 \\ \hline 136,20 \text{ Ans} \end{array}$$

3. Required the amount of the same sum for 5 years. at the same rate: Ans. 590dolls. 20cts.

$$\begin{array}{r} 154 \\ 6 \\ \hline 2724 \\ 5 \\ \hline 13620 \\ 15400 \\ \hline 590,20 \text{ Ans} \end{array}$$

4. What is the interest of 200dolls for 2 years, at 6 percent: Ans. 24dolls

$$\begin{array}{r} 200 \\ 6 \\ \hline 1200 \\ 2 \\ \hline 2400 \text{ Ans} \end{array}$$

5. What is the interest of 1260 dolls. for 4 years. at 4 percent: Ans. 352dolls. 80cents.

$$\begin{array}{r} 1260 \\ 4 \\ \hline 8820 \\ 4 \\ \hline 352,80 \text{ Ans} \end{array}$$

6. What is the amount of a note for 560 dollars for 3 years. at 8 percent: Ans. 694dolls. 40cts.

$$\begin{array}{r} 560 \\ 8 \\ \hline 4480 \\ 3 \\ \hline 13440 \\ 56000 \\ \hline 694,40 \text{ Ans} \end{array}$$

7. What sum must be given to discharge a bond given for 4520 dollars. on which there is 6 years interest at 5 percent:

Ans. 5846 dolls

$$\begin{array}{r} 4520 \\ 5 \\ \hline 22600 \\ 6 \\ \hline 135600 \\ 452000 \\ \hline 5846,00 \text{ Ans} \end{array}$$

L

Simple Interest

8. What is the amount of 400 dollars for 2 years at 6% per cent.

Ans. 452 dolls.

$$\begin{array}{r}
 400 \\
 6\frac{1}{2} \\
 \hline
 2400 \\
 200 \\
 \hline
 2600 \\
 2 \\
 \hline
 5200 \\
 40000 \\
 \hline
 45200 \text{ Ans}
 \end{array}$$

9. What is the interest of 4925 dolls for 9 years at 7% per cent.

Ans. 3324 dolls. 34 cts. 5 m.

$$\begin{array}{r}
 4925 \\
 7\frac{1}{2} \\
 \hline
 34475 \\
 24625 \\
 \hline
 369375 \\
 9 \\
 \hline
 3324375 \text{ Ans}
 \end{array}$$

10. What is the amount of 2500 dollars for 1 year at 7% per cent.

Ans. 2693 dolls. 75 cts.

$$\begin{array}{r}
 2500 \\
 7\frac{1}{2} \\
 \hline
 12500 \\
 17500 \\
 \hline
 19500 \\
 1937500 \\
 \hline
 25000000 \text{ Ans}
 \end{array}$$

[Large decorative flourish]

SSS case 2. SSS

1. What is the interest of 264 dollars 50 cents for 1 year at 6 per cent. Ans. 15 dolls 5 cts.

$$\begin{array}{r}
 264.50 \\
 6 \\
 \hline
 1587.00 \text{ Ans}
 \end{array}$$

2. What is the interest of 468 dollars 22 cents and 5 mills for 1 year at 8 per cent. Ans. 37 dolls 45 cts 8 mills

$$\begin{array}{r}
 468.225 \\
 8 \\
 \hline
 374518.00 \text{ Ans}
 \end{array}$$

3. What is the interest of 364 dolls 50 cents for 5 years at 6 per cent. per annum. Ans. 109 dolls 36 cents.

$$\begin{array}{r}
 364.50 \\
 6 \\
 \hline
 218700 \\
 1093500 \text{ Ans}
 \end{array}$$

4. What is the amount of a note for 1260 dollars 50 cents and 5 mills for 3 years at 7% per cent. per annum. Ans. 1544 dolls. 11 cents 5 m.

$$\begin{array}{r}
 1260.505 \\
 7\frac{1}{2} \\
 \hline
 6302525 \\
 8823535 \\
 \hline
 94537875 \\
 3 \\
 \hline
 283619625 \\
 1260505 \\
 \hline
 1544115 \text{ Ans}
 \end{array}$$

Simple Interest

5. what sum will discharge a bond given for 630 dollars 50cts on which there is 5 years interest at 8 percent per annum:

Ans. 882 dollars 40cts

$$\begin{array}{r} 630.50 \\ 504400 \\ \hline 2522000 \\ 63050 \\ \hline 88240 \end{array}$$

Case 3

1. what is the interest of 650 dollars for 8 months at 6 percent per annum: Ans 26 dollars

$$\begin{array}{r} 650 \\ 4 \text{ half the months} \\ \hline \text{cents } 2600 \end{array}$$

2 what is the interest of 860 dollars for 1 year and 6 months at 6 percent per annum:

$$\begin{array}{r} 860 \\ 9 \text{ half the months} \\ \hline \text{Ans } 44 \text{ dollars } 40 \text{ cts} \end{array}$$

3. what is the interest of 420 dollars for 9 months at 8 percent per annum:

$$\begin{array}{r} 420 \\ 9 \text{ months} \\ 8 \text{ percent} \\ \hline 2520 \text{ Ans } 25 \text{ dollars } 20 \text{ cts} \end{array}$$

4. What is the amount of a note for 424 dollars with 18 months interest due thereon at 4 percent per annum: Ans. 464 dollars 44 cents.

$$\begin{array}{r} 424 \\ 18 \\ \hline 4344 \\ 42400 \\ \hline 46444 \text{ Ans} \end{array}$$

5. What is the interest of 240 dollars for 15 months at 4 1/2 percent per annum: Ans. 22 dollars 50 cents.

$$\begin{array}{r} 240 \\ 15 \text{ months} \\ 4.5 \\ \hline 105 \\ 12 \overline{) 112.5} \\ \underline{9.375} \\ 240 \\ 345000 \\ 18450 \\ \hline 225000 \text{ Ans} \end{array}$$

6. What is the interest of 1260 dollars for 4 months at 6 1/2 percent per annum: Ans. 24 dollars 30 cts.

$$\begin{array}{r} 1260 \\ 4 \\ 6.5 \\ \hline 4560 \\ 1260 \\ \hline 2520 \\ 2429.160 \text{ Ans} \end{array}$$

Handwritten flourish or signature.

Simple Interest

Case 4.

5. What is the interest of 12000 dollars for 40 days at 7 percent per annum: Ans. 1606.25

$$\begin{array}{r} 12000 \text{ no} \\ 6083 \overline{) 12000000} \quad 40 \text{ days} \\ \underline{46920} \quad 7\% \text{ Ans} \\ 109100 \\ \underline{104280} \\ 31200 \end{array}$$

6. What is the interest of 5000 dollars for 20 days at 5 percent per annum: Ans. 230.00

$$\begin{array}{r} 5000 \text{ no} \\ 7300 \overline{) 1680000} \quad 20 \text{ days} \\ \underline{14600} \quad 5\% \text{ Ans} \\ 22000 \\ \underline{21900} \\ 100 \end{array}$$

7. 514.90 for 81 days at 6 percent per annum: Ans. 15.78.1

$$\begin{array}{r} 51490 \text{ no} \\ 6083 \overline{) 4350360} \quad 81 \text{ days} \\ \underline{42581} \quad 6\% \text{ Ans} \\ 9226 \\ \underline{6083} \\ 31430 \\ \underline{30415} \\ 10150 \\ \underline{6083} \\ 4067 \end{array}$$

8. 73.41 for 24 days at 7 percent per annum: Ans. 33

$$\begin{array}{r} 7341 \text{ no} \\ 6083 \overline{) 198207} \quad 24 \text{ days} \\ \underline{182119} \quad 7\% \text{ Ans} \\ 15914 \\ \underline{12166} \\ 35510 \\ \underline{30415} \\ 5095 \end{array}$$

9. 225.24 for 46 days at 7 percent per annum: Ans. 18.1

$$\begin{array}{r} 22524 \text{ no} \\ 6083 \overline{) 900960} \quad 46 \text{ days} \\ \underline{6083} \quad 7\% \text{ Ans} \\ 29266 \\ \underline{24332} \\ 49340 \\ \underline{48664} \\ 6760 \\ \underline{6083} \\ 677 \end{array}$$

10. 1200.00 for 80 days at 6 percent per annum: Ans. 15.78.1

$$\begin{array}{r} 120000 \text{ no} \\ 6083 \overline{) 9600000} \quad 80 \text{ days} \\ \underline{1083} \quad 6\% \text{ Ans} \\ 351700 \\ \underline{30415} \\ 44550 \\ \underline{42581} \\ 19690 \\ \underline{18664} \\ 10260 \\ \underline{6083} \\ 4177 \end{array}$$

Simple Interest

2. Paid 858 dollars in full for a note given for 650 dollars with 11 years interest due thereon:

what was the rate percent per annum charged on said note: Ans. 8 per cent.

$$\begin{array}{r} 858 \\ 650 \\ \hline 208 \end{array} \quad \begin{array}{l} P \\ P \\ P \\ P \\ P \end{array} \quad \begin{array}{l} 650 : 208 :: 100 : 32 \\ 100 \\ 650 \overline{) 20800} 32 \\ \underline{1950} \\ 1300 \quad \text{Ans} \\ 1300 \end{array}$$

3. At what rate percent will 1600 dollars amount to 2752 dollars in 12 years: Ans. 6 percent.

$$\begin{array}{r} 2752 \\ 1600 \\ \hline 1152 \end{array} \quad \begin{array}{l} P \\ P \\ P \\ P \\ P \end{array} \quad \begin{array}{l} 1600 : 1152 :: 100 : 72 \\ 100 \\ 1600 \overline{) 115200} 72 \\ \underline{11200} \\ 3200 \quad \text{Ans} \\ 3200 \end{array}$$

Case 7.

2. In what time will 650 dollars amount to 910 dollars at 8 per cent. per annum: Ans. 5 years

$$\begin{array}{r} 650 \\ 8 \\ \hline 5200 \end{array} \quad \begin{array}{l} P \\ P \\ P \\ P \\ P \end{array} \quad \begin{array}{l} 650 : 260 :: 1 : 5 \\ 650 \text{ amount} \\ 650 \text{ principal} \\ 260 \end{array} \quad \begin{array}{l} 52 \overline{) 2600} 5 \text{ Ans} \\ \underline{260} \end{array}$$

3. In what time will 1600 dollars amount to 2080 dollars at 6 per cent. per annum: Ans. 5 years.

$$\begin{array}{r} 1600 \\ 6 \\ \hline 9600 \end{array} \quad \begin{array}{l} P \\ P \\ P \\ P \\ P \end{array} \quad \begin{array}{l} 1600 : 480 :: 1 : 5 \\ 9600 \text{ amount} \\ 1600 \text{ principal} \\ 480 \end{array} \quad \begin{array}{l} 96 \overline{) 4800} 5 \text{ Ans} \\ \underline{480} \end{array}$$

Case 8.

Simple Interest

1. A has B's note for 1000 dollars. dated 1st January 1816, payable in 18 months with interest from the date. At 6 percent per annum. On which the following payments are endorsed. viz.

| |
|----------|
| 1000 |
| 30.00 |
| 1000 |
| 1030 |
| 230 |
| 800 |
| 24.00 |
| 800 |
| 824.00 |
| 300 |
| 524 |
| 524 |
| 262 |
| 786 |
| 524 |
| 531.86 |
| 254 |
| 277.86 |
| 100 |
| 277.86 |
| 12.593 |
| 290.453 |
| 277.86 |
| 252.6279 |

see p

third p

forth

1. A bond was given to B to C. for 2000 dollars, payable in 2 years. with interest from the date. Dated July 1. 1815. On this bond the following payments are endorsed, viz. May 1. 1816. 900 dollars. Oct. 1. 1816. 150 dollars. Jan 1. 1817. 620 dollars. Required the amount due on the 1st of May 1817.

1815. July 1. principal 2000 dollars.

1816. May 1. 2000 multiplied by 304 729600

paid 400

Oct. 1. 1500

paid 150

153

229500

1816. Jan 1. 1050

Paid 620

92

96600

May 1. 18455

interest

120

5160.0

Divide by 60 1107300

Balance 614.55 Ans

184.55 interest

| | | | | |
|------|--------|-------|--------|--------|
| 2400 | 1050 | 3 | 2 | 1 |
| 900 | 620 | | 1500 | 2400 |
| 1500 | 430 | 1500 | 153 | 304 |
| 450 | 120 | 450 | 1500 | 9600 |
| 1050 | 8600 | 1050 | 7500 | 0000 |
| 620 | 430 | 92 | 1500 | 7200 |
| 430 | 51600 | 2100 | 229500 | 729600 |
| | 229500 | 96600 | | |
| | 729600 | | | |
| | 96600 | | | |

6.0/110730.0
184,55 interest
430

Balance 614,55 \$us

Compound Interest James

3. What is the amount of 1500 dollars for 5 years, at 5 percent. per annum. Ans 1914 dolls. 12 cts.

3.20713
650
16035650
1924278
208463.450 Ans

127625
1500
63811000
127625
191442.000 Ans

4. What is the compound interest of 4500 dollars for 16 years, at 6 percent. per annum.

Ans. 6931 dolls. 57 cts. 5 m.

254035
4500
124017500
1016140
1143157.500
4500
6931.57.500 Ans

6. A father left a legacy of 8000 dollars at compound interest, 6 percent. per annum. to be equally divided among his three sons. when the youngest, who was 11 years old, should arrive at the age of 21; what will be each one's share

Ans. 7180 dolls. 72 cts. each share

2.69277
8000
3/2154216000
718072 Ans

5. A has B's note for 550 dollars, payable at the end of 20 years, at 6 percent. per annum, compound interest; what sum will it require to discharge the note at the expiration of the given time?

Ans. 2084 dolls. 63 cts. 4 m.

Insurance Commission

Section 11.

1 What is the premium of insuring
1200 dollars at 5 per cent:

$$\begin{array}{r} 1200 \\ 63,00 \end{array}$$
 Ans 63 dollars

2. 1650 dollars at $15\frac{1}{2}$ per cent.

Ans. 255.75

$$\begin{array}{r} 1650 \\ 15.5 \\ \hline 8250 \\ 1650 \\ 825 \\ \hline 25575 \text{ Ans} \end{array}$$

3. 4500 dolls 25 Ans 1125 00

$$\begin{array}{r}
 1500 \\
 25 \\
 \hline
 22500 \\
 9000 \\
 \hline
 112500 \text{ Acres}
 \end{array}$$

11. What sum must a policy be taken out for to cover 900 dollars when the premium is 10 per cent.

$$\begin{array}{r} 100 \\ \underline{100} \\ 90 \end{array}$$

90 : 100 : 900

$$\begin{array}{r} 90 \overline{) 90000} \\ \underline{90} \\ 000 \end{array} \quad \begin{array}{l} 1000 \\ \text{ans} \end{array}$$

5. What sum will it require to cover
a policy of insurance for 1500 doll
ars. at 25 percent. 150000 dollars.

$$\begin{array}{r} 100 \\ 25 \\ \hline 75 \end{array}$$

6. What sum will it require to cover
a policy of insurance for 560 dolls.
at 9 per cent:

$$\begin{array}{r} 100 \\ 9 \\ \hline 91 \end{array}$$

91 : 100 :: 560

$$\begin{array}{r} 100 \\ \hline 15000 \overline{) 615386} \\ \underline{546} \\ 110 \\ 91 \\ \hline 190 \\ 155 \\ \hline 350 \\ 222 \\ \hline 440 \\ 428 \\ \hline 1216 \\ 8 \overline{) 9113} \end{array}$$

James McCormick

And Brokage And Brokage Insurance Commission

(commission.)))

2 What is the commission on 1260 dollars at 6 percent:

Ans. 75 dolls. 60 cts.

$$\begin{array}{r} 1260 \\ 6 \\ \hline 7560 \text{ Ans} \end{array}$$

3. 2550 dolls at 4 percent. Ans. 102 00

$$\begin{array}{r} 2550 \\ 4 \\ \hline 10200 \text{ Ans} \end{array}$$

4. 26342 dolls 3 percent Ans 790 26

$$\begin{array}{r} 26342 \\ 3 \\ \hline 79026 \text{ Ans} \end{array}$$

5. 6422 $6\frac{2}{3}$ Ans 426 6 $\frac{2}{3}$

$$\begin{array}{r} 6422 \\ .75 \\ \hline 4816.50 \text{ Ans} \end{array}$$

6. A commission merchant receives 1260 dollars to fill an order, from which he is instructed to deduct his own commission of 5 percent. how much will remain to satisfy the order:

1200 dolls. Ans

$$\begin{array}{r} 100 \\ 5 \\ \hline 105 : 100 :: 1260 \end{array}$$

$$\begin{array}{r} 105 \overline{) 126000} \\ 105 \\ \hline 210 \\ 210 \\ \hline 00 \end{array}$$

7. A commission merchant has received 4120 dollars with instruction to vest it in salt at 5 dolls per barrel: deducting from it his commission of 3 percent. how many barrels of salt can he purchase:

Ans. 500 barrels.

$$\begin{array}{r} 100 \\ 3 \\ \hline 103 : 100 :: 4120 \end{array}$$

$$\begin{array}{r} 103 \overline{) 41200} \\ 103 \\ \hline 000 \end{array}$$

$$\begin{array}{r} 8 \overline{) 4000} \\ 500 \text{ Ans} \end{array}$$

Insurance Commission and Brokerage

Brokerage. III

2. What is the Brokerage on 1625 dollars 50 cents, at $3\frac{1}{2}$ percent:
 ans. 54 dolls. 18 cts.

$$\begin{array}{r}
 1625.50 \\
 \times 3\frac{1}{2} \\
 \hline
 487650 \\
 541833 \\
 \hline
 541833 \text{ Ans}
 \end{array}$$

3. 1868 dollars at $2\frac{1}{2}$ percent.
 ans. 46 dolls. 40 cts.

$$\begin{array}{r}
 1868 \\
 \times 2\frac{1}{2} \\
 \hline
 3436 \\
 934 \\
 \hline
 4640 \text{ Ans}
 \end{array}$$

4. 560 at 6 33 dolls 60 cts

$$\begin{array}{r}
 560 \\
 \times 6 \\
 \hline
 3360 \text{ Ans}
 \end{array}$$

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Buying and Selling Stocks

Section 5.

1. What is the amount of 1650 dolls. United States bank stock, at 125 per cent. or 25 per cent. above par?

$$\begin{array}{r}
 1650 \\
 125 \\
 \hline
 8250 \\
 3300 \\
 1650 \\
 \hline
 100)206250 \text{ Ans } 2062 \text{ dolls } 50 \text{ cts} \\
 \text{Or thus } 25 \text{ is } \frac{1}{4} \text{ of } 100 \\
 \begin{array}{r}
 1650 \\
 41250 \\
 \hline
 206250 \text{ Ans}
 \end{array}
 \end{array}$$

2. 1500 bank stock at 110 per cent.

$$\begin{array}{r}
 1500 \\
 110 \\
 \hline
 15000 \\
 1500 \\
 \hline
 165000 \text{ Ans}
 \end{array}$$

3. 1686 at 128 Ans 2158.08

$$\begin{array}{r}
 1686 \\
 128 \\
 \hline
 13488 \\
 3372 \\
 \hline
 16860 \\
 215808 \text{ Ans}
 \end{array}$$

4. 25000 at 108 Ans 27000.00

$$\begin{array}{r}
 25000 \\
 108 \\
 \hline
 2200000 \\
 250000 \\
 \hline
 2700000 \text{ Ans}
 \end{array}$$

5. 1260 at 90 Ans 1134.00

$$\begin{array}{r}
 1260 \\
 90 \\
 \hline
 113400 \text{ Ans}
 \end{array}$$

6. 925 at 84 Ans 777.36

$$\begin{array}{r}
 925 \\
 84 \\
 \hline
 34016 \\
 44032 \\
 \hline
 779336 \text{ Ans}
 \end{array}$$

7. 1518 at 83 1/2 Ans 1271.32 1/2

$$\begin{array}{r}
 1518 \\
 83.75 \\
 \hline
 7590 \\
 10626 \\
 4554 \\
 12144 \\
 \hline
 127132.50 \text{ Ans}
 \end{array}$$

Rate of Discount

Section 6.

2. What is the present worth of 2464 dollars due 1 year and 1 month hence, discounting at the rate of 8 per cent. per annum.

Ans 2200 dollars.

$$112 : 100 :: 2464 : x$$

$$112 \overline{) 246400} \begin{array}{r} 2200 \\ 2240 \\ \hline 240 \\ 224 \\ \hline 160 \\ 112 \\ \hline 48 \\ 448 \\ \hline 0 \end{array}$$

3. A has B's note for 1864 dollars 50 cents payable 8 months after date: what is the present worth of said note discounting at the rate of 6 per cent. per annum. Ans. 1791 dollars 80 cts.

$$103.66 : 100 :: 1864.50 : x$$

$$103.66 \overline{) 186450} \begin{array}{r} 1791.15 \\ 10366 \\ \hline 82790 \\ 72562 \\ \hline 102280 \\ 93294 \\ \hline 89860 \\ 10366 \\ \hline 79490 \\ 72562 \\ \hline 69280 \\ 10366 \\ \hline 58910 \\ 51830 \\ \hline 7080 \end{array}$$

4. What reduction must be made for prompt payment of a note for 650 dollars due 2 years hence, 8 per cent. per annum. being allowed for discount:

Ans. 79 dollars 83 cts.

$$114 : 100 :: 650 : x$$

$$114 \overline{) 65000} \begin{array}{r} 570.17 \\ 570 \\ \hline 8000 \\ 798 \\ \hline 200 \\ 114 \\ \hline 860 \\ 798 \\ \hline 62 \end{array}$$

5. What is the present worth of 5150 dollars due in 12 months discounting at the rate of 8 per cent. per annum. and allowing 1 per cent. for prompt payment:

Ans. 4950 dollars

$$103 : 100 :: 5150 : x$$

$$103 \overline{) 515000} \begin{array}{r} 4990.29 \\ 10300 \\ \hline 12000 \\ 10300 \\ \hline 17000 \\ 10300 \\ \hline 67000 \\ 67000 \\ \hline 0 \end{array}$$

2222222222

Rebate or Discount

1. What is the discount of 1272 dollars due in 12 months discounting at 6 percent per annum.

$$106 : 100 :: 1272 : 1200$$

Discount 72

1. What much is the discount of 260 dollars at 5 percent

$$\frac{260}{1300} \text{ Ans. } 13 \text{ dollars}$$

2. What is the interest of the same sum for the same time and rate:

$$\begin{array}{r} 1272 \\ 6 \\ \hline 211.6 \end{array} \text{ interest. } \begin{array}{r} 76.32 \\ 72 \\ \hline 14.32 \end{array}$$

2. What is the discount on 1650 dollars at 3 percent.

$$\text{Ans. } 49 \text{ dollars } 50 \text{ cts.}$$

$$\begin{array}{r} 1650 \\ 3 \\ \hline 49.50 \end{array} \text{ Ans}$$

3. What is the difference between the interest and discount 7280 dollars for 18 months at 8 percent per annum: Ans. 93 dollars 60 cts. difference

$$12 : 8 :: 18$$

$$\begin{array}{r} 12 \overline{) 144} \\ 12 \\ \hline 100 \end{array} \quad \begin{array}{r} 12 \overline{) 144} \\ 12 \\ \hline 100 \end{array}$$

$$112 : 100 :: 7280$$

$$\begin{array}{r} 7280 \\ 6500 \\ \hline 780 \end{array}$$

$$\begin{array}{r} 112 \overline{) 72800} \\ 672 \\ \hline 560 \\ 560 \\ \hline 00 \end{array}$$

$$\begin{array}{r} 7280 \\ 8 \\ \hline 58240 \\ 29120 \\ \hline 87360 \\ 780 \\ \hline 9360 \end{array} \text{ Ans}$$

3. What sum will discharge a bond for 2464 dollars on which a discount of 8 percent is given: Ans. 2266 dollars 88 cents.

$$\begin{array}{r} 2464 \\ 8 \\ \hline 19712 \end{array}$$

$$\begin{array}{r} 246400 \\ 19712 \\ \hline 226688 \end{array}$$

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Bank Discount James

Section 1

2. What is the discount of 250 dollars for 30 days:

Ans. 1 dollar 11 $\frac{2}{3}$ cts

$$\begin{array}{r}
 250 \\
 34 \\
 \hline
 1000 \\
 750 \\
 \hline
 60 \overline{) 8500} \\
 111\frac{2}{3} \text{ Ans}
 \end{array}$$

5. What is the discount of 2649 dollars 75 cents for 60 days:

Ans. 28 dolls. 26 cents 11 m.

$$\begin{array}{r}
 2649\ 75 \\
 64 \\
 \hline
 1059900 \\
 1589850 \\
 \hline
 60 \overline{) 16958400} \\
 2826.40 \text{ Ans}
 \end{array}$$

3. What is the discount of 600 dollars for 90 days:

Ans. 9 dolls. 10 cts.

$$\begin{array}{r}
 600 \\
 94 \\
 \hline
 2400 \\
 5400 \\
 \hline
 60 \overline{) 56400} \\
 940 \text{ Ans}
 \end{array}$$

4. what is the discount of 1200 dollars 40 cents for 60 days:

Ans. 13 dollars 14 cts.

$$\begin{array}{r}
 1200\ 40 \\
 64 \\
 \hline
 504160 \\
 756240 \\
 \hline
 60 \overline{) 8066560} \\
 1344.42 + \text{ Ans}
 \end{array}$$

Equation of Payments

Section 8.

1. A owes B 600 dollars of which 200 is to be paid in 4 months, 200 at 8 months, and 200 at 12 months: but they agree to make but one payment: when must that payment be made?

$$\begin{array}{r} 200 \times 4 = 800 \\ 200 \times 8 = 1600 \\ 200 \times 12 = 2400 \\ \hline 600 \overline{) 4800} \text{ (8 months) thus} \\ 4800 \end{array}$$

2. A merchant has owing to him from his friend the sum of 3000 dollars to be paid as follows: viz. 500 dollars at 2 months, 1000 dollars at 5 months, and the rest at 8 months: but they agree to make one payment of the whole: what will be the mean time of payment? Ans. 6 months.

$$\begin{array}{r} 500 \times 2 = 1000 \\ 1000 \times 5 = 5000 \\ 1500 \times 8 = 12000 \\ \hline 3000 \overline{) 18000} \text{ (6 months)} \\ 18000 \end{array}$$

3. A buys of B 50 acres of land for which he agrees to pay 1000 dollars at the following times: viz. 200 dollars at 5 months, 300 dollars at 8 months, and the rest at 10 months: but an equation of payments is afterwards agreed upon: when must the payment be made?

Ans. 8 months 12 days.

$$\begin{array}{r} 200 \times 5 = 1000 \\ 300 \times 8 = 2400 \\ 500 \times 10 = 5000 \\ \hline 1000 \overline{) 8400} \text{ (8, 12 thus)} \\ 8000 \\ 4000 \\ 12700 \text{ (12)} \\ 10000 \\ 2000 \\ 2000 \end{array}$$

4. C owes D 1000 dollars to be paid in 8 months: but D being in want of money, C pays him 1000 dollars at the expiration of 2 months: how much longer than 2 months may he in Justice defer the payment of the rest? Ans. 2 1/2 months.

$$\begin{array}{r} 1000 : 1 :: 400 \\ 400 \overline{) 1000} \text{ (2 months)} \\ 800 \\ 200 \\ 200 \end{array}$$

215 days

$$\begin{array}{r} 400 \overline{) 6000} \text{ (125 days)} \\ 4000 \\ 2000 \end{array}$$

5. 1000 x 3 = 3200
1000 x 1 = 1000
2200 (55)
2000 (25) Ans
2000

Fellowship

James McCom

Section 9.

Two merchants join their stock in trade: A puts in 600 dollars, and B puts in 400 dollars, and they gain 250 dollars: what part belongs to each;

$$\begin{array}{r} A 600 \\ B 400 \\ \hline 1000 \end{array} \quad \begin{array}{l} 1000 : 250 :: 600 \text{ to } A \text{ } 150 \\ \quad \quad \quad 400 \text{ to } B \text{ } 100 \\ \hline 250 \end{array}$$

$$\begin{array}{r} 18000 : 5400 :: 4500 \\ \hline 2700000 \\ 21600 \\ \hline 2430000 \end{array} \quad \begin{array}{l} 1350 \text{ Ans} \\ 18000 \\ 63000 \\ 54000 \\ 90000 \\ 90000 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 2250 \text{ dollars} \\ 31800 \\ 1350 \\ \hline 5400 \text{ Profit} \end{array}$$

3. A bankrupt is indebted to A 1291 dollars 23 cents, to B 500 dollars 37 cents, to C 89 dollars 40 cents, to D 228 dollars; and his estate is worth but 2046 dollars 75 cents: how much does he pay per cent, and how much is each creditor to receive:

$$\begin{array}{r} 1291.23 \\ 500.37 \\ 89.40 \\ 228 \\ \hline 2129.00 : 2046.75 :: 1291.23 \\ \hline 1291.23 \\ 6140.25 \\ 4093.50 \\ 2046.75 \\ 18420.75 \\ 4093.50 \\ 2246.75 \\ \hline 26128.25025 \end{array} \quad \begin{array}{l} 968.42 \text{ to } A \text{ Ans} \\ 245610.0 \\ 1864250 \\ 1624400 \\ \hline 2298500 \\ 2183200 \\ \hline 1153002 \\ 1041600 \\ \hline 614025 \\ 545800 \\ 68225 \\ \hline 2729000 \\ 2729000 \end{array}$$

2. Three merchants enter into partnership in trade: A advanced 4500 dollars, B 6000, and C 4500, with this they gained 5000 dollars: what was each partner's share:

$$\begin{array}{r} 4500 \\ 6000 \\ 4500 \\ \hline 15000 : 5000 :: 4500 \\ \hline 2700000 \\ 37800 \\ \hline 40500000 \end{array} \quad \begin{array}{l} 2250 \text{ Ans} \\ 36000 \\ 45000 \\ 36000 \\ 90000 \\ 90000 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 18000 : 5400 :: 6000 \\ \hline 6000 \\ 18000 : 32400000 \end{array} \quad \begin{array}{l} 1800 \text{ Ans} \\ 18000 \\ 144000 \\ 144000 \\ \hline 00 \end{array}$$

Single Fellowship

$$272900:204675::50037$$

$$\begin{array}{r} 1432725 \\ 614025 \\ 32100 \\ 102307500 \\ 10241322945(375.27\frac{3}{4} \text{ Ans} \\ 818700 \\ 2054322 \\ 1910300 \\ 1440229 \\ 1364500 \\ 757295 \\ 545800 \\ 2114950 \\ 1910300 \\ 204650 \\ 818700(3\frac{3}{4} \\ 818700 \end{array}$$

$$272900:204675::70940$$

$$\begin{array}{r} 70940 \\ 8187000 \\ 1842075 \\ 11327250 \\ 14519644500(53295 \\ 1364500 \\ 8746444 \\ 818700 \\ 559445 \\ 545800 \\ 1364500 \\ 1364500 \end{array}$$

$$272900:204675::228$$

$$\begin{array}{r} 228 \\ 1637400 \\ 409350 \\ 409350 \\ 46665900(141 \text{ Ans} \\ 272900 \\ 1937590 \\ 1910300 \\ 272900 \\ 272900 \end{array}$$

75 percent. $\left\{ \begin{array}{l} A \text{ receives } 96842\frac{1}{2} \\ B \\ C \end{array} \right.$
 Ans. he pays $\left\{ \begin{array}{l} 37527\frac{3}{4} \\ 53205 \\ 141 \end{array} \right.$

$$272900:204675::100$$

$$\begin{array}{r} 100 \\ 20467500(75 \text{ percent} \\ 1910300 \\ 1364500 \\ 1364500 \end{array}$$

11. Three men. A. B. and C. rent a farm containing 585 acres 2 roods and 31 perches at 600 dollars per year; of which A pays 180 dols. B. 195, and C. 225. and they agree that the farm shall be divided in proportion to the rents; how many acres must each man have:

| | | | |
|-----|------|---|----|
| A | B | C | R |
| 180 | 585 | 2 | 31 |
| 195 | 4 | | |
| 225 | 2342 | | |
| 600 | 40 | | |

$$: 93714 : : 180$$

$$\begin{array}{r} 7497120 \\ 93714 \end{array}$$

$$600/16868520(28114$$

$$\begin{array}{r} 1200 \\ 11573 \\ 11500 \end{array}$$

$$\begin{array}{r} 655 \\ 611 \end{array}$$

$$\begin{array}{r} 152 \\ 600 \end{array}$$

$$\begin{array}{r} 2520 \\ 2400 \end{array}$$

$$12) \frac{120}{600} = \frac{1}{5}$$

$$400/28114$$

$$902=3$$

$$175-2=34\frac{1}{2}$$

Single Fellowship

James McNamee

$$600 : 93714 :: 195$$

$$\begin{array}{r} 195 \\ 468570 \\ 843426 \\ 93714 \\ \hline 600 \overline{) 18274230} \quad (30457 \\ 1800 \\ \hline 2742 \\ 2400 \\ \hline 3423 \\ 3000 \\ \hline 4230 \\ 4200 \\ \hline 30 \\ 300 = 1 \\ 3 \overline{) 600} = 20 \end{array}$$

$$600 : 93714 :: 225$$

$$\begin{array}{r} 225 \\ 468570 \\ 187128 \\ 187428 \\ \hline 600 \overline{) 21085650} \quad (35112 \\ 1800 \\ \hline 3085 \\ 3000 \\ \hline 856 \\ 600 \\ \hline 2565 \\ 2400 \\ \hline 1650 \\ 1200 \\ \hline 450 \\ 15 \overline{) 600} = 40 \end{array}$$

| | A's share is | P | P |
|----------|--------------|---|-----------------|
| Ans. A's | 175 | 2 | $34\frac{1}{2}$ |
| B's | 190 | 1 | $17\frac{1}{2}$ |
| C's | 219 | 2 | $22\frac{3}{4}$ |

5. Three merchants freighted a ship with 2160 barrels of flour of which 960 barrels belonged to A. 720 barrels to B. and 480 barrels to C; but on account of stormy weather they were obliged to throw 900 barrels overboard: how many barrels did each man lose?

$$\begin{array}{r} B \\ 960 \\ 720 \\ 480 \\ \hline 2160 : 900 :: 960 \\ 960 \\ 54000 \\ 8100 \\ \hline 864000 \quad (400 \text{ Ans} \\ 8640 \\ \hline 00 \end{array}$$

$$2160 : 900 :: 720$$

$$\begin{array}{r} 720 \\ 18000 \\ 6300 \\ \hline 2160 \overline{) 648000} \quad (300 \text{ Ans} \\ 6480 \\ \hline 00 \end{array}$$

$$2160 : 900 :: 480$$

$$\begin{array}{r} 480 \\ 2160 \overline{) 432000} \quad (200 \text{ Ans} \\ 4320 \\ \hline 00 \end{array}$$

Alas! 400 barrels lost.

| | |
|---|-----|
| B | 300 |
| C | 200 |

6. Three merchants join stock in trade: A put in 1260 dollars, B 840 dollars and C a certain sum, and they gained 825 dollars of which C took for his part 275 dollars; required A and B's part of the gain, and how much stock C put in:

Single Fellowship

$$\begin{array}{r}
 D \\
 1260 \\
 840 \\
 \hline
 2100
 \end{array}
 \begin{array}{l}
 325 \text{ whole gain} \\
 325 \text{ C's gain} \\
 : 550 :: 1260 \\
 \hline
 33000 \\
 1100 \\
 550 \\
 \hline
 2100/693000 \quad 550 \text{ A's B's G} \\
 6300 \quad 330 \text{ C's G} \\
 6300 \quad 220 \text{ B's G} \\
 6300 \\
 \hline
 0
 \end{array}$$

$$220:840::275$$

$$\begin{array}{r}
 275 \\
 4200 \\
 5880 \\
 1680 \\
 \hline
 231000 \quad 1050 \text{ C's stock} \\
 220 \\
 1100 \\
 \hline
 1100
 \end{array}$$

Ans C gained 230 dolls.
C's stock was 1050

7. Four men traded with a stock of 800 dollars, and they gained in two years time twice as much, and no dollars over; A's stock was 140 dollars, B's 260. C's 300; required D's stock, and what each gained:

$$\begin{array}{r}
 D \\
 140 \\
 260 \\
 300 \\
 100 \\
 \hline
 800
 \end{array}
 \begin{array}{l}
 800 \\
 400 \\
 \hline
 100 \text{ D's stock}
 \end{array}$$

$$800:1640::140$$

$$\begin{array}{r}
 65600 \\
 640 \\
 \hline
 800/229600 \quad 287 \text{ A's share} \\
 1600 \\
 6960 \\
 6400 \\
 \hline
 5600
 \end{array}$$

$$800:1640::260$$

$$\begin{array}{r}
 98400 \\
 3280 \\
 \hline
 800/426400 \quad 533 \text{ B's share} \\
 4000 \\
 2640 \\
 2400 \\
 \hline
 2400
 \end{array}$$

$$800:1640::300$$

$$\begin{array}{r}
 300 \\
 800/492000 \quad 615 \text{ C's share} \\
 4800 \\
 1200 \\
 800 \\
 \hline
 4000 \\
 4000
 \end{array}$$

$$800:1640::100$$

$$\begin{array}{r}
 100 \\
 800/16400 \quad 205 \text{ D's share} \\
 1600 \\
 4000 \\
 4000
 \end{array}$$

D's stock was 100 dollars
A's gain was 287
Ans B's 533
C's 615
D's 205

Compound Fellowship

Examples S S S

What is each man's share:

1. Three merchants entered into
Trade: A put in 2500 dollars
for 12 months. B 3000 dollars
for 6 months, and C 1000 dolls
for 8 months, and they gained
1200 dollars what is each man's
share of the gain:

$A \quad 2500 \times 4 = 10000$
 $B \quad 3000 \times 6 = 18000$
 $C \quad 11000 \times 8 = 88000$

Sum 60000

Sum 60000
As 60000:1200::10000:200.00
18000:360.00
32000:640.00

1200
proof

2. Three merchants enter into partnership for 16 months: A put into stock at first 600 dollars. and at the end of 8 months, 200 dollars more; B put in at first 1200 dollars. but at the end of 10 months. was obliged to take out 600 dollars; C put in at first 1000 dollars. and at the end of 12 months put in 800 more: with this stock they gained 2300 dollars:

$$\begin{array}{l} 600 \times 16 = 9600 + 1600 = 11200 \\ 200 + 8 = 1600 \\ 1200 \times 10 = 12000 + 3600 = 15600 \\ \underline{600} \\ 600 \times 6 = 3600 \\ 1000 \times 16 = 16000 + 3200 = 19200 \\ 000 + 4 = 3200 \end{array}$$

$$\begin{array}{r} 46000 \\ 46000 : 2300 :: 11200 \\ 11200 \end{array}$$

$$\begin{array}{r}
 460000 \\
 2300 \\
 2300 \\
 \hline
 25760000 \\
 2300 \\
 \hline
 176 \\
 176 \\
 \hline
 0
 \end{array}$$

$46000:2300::15600$
 $\begin{array}{r} 2300 \\ \hline 4680000 \\ 31200 \\ \hline 35880000 \end{array}$
 $46000 \overline{) 35880000}$
 $\begin{array}{r} 322 \\ \hline 368 \\ 368 \\ \hline 0 \end{array}$

$$\begin{array}{r} 46000:2300::19200 \\ \underline{2300} \\ 5460000 \\ 38400 \\ \underline{44160000} \quad (960000) \\ 414 \\ \underline{246} \\ 246 \\ \underline{} \end{array}$$

Ans. $\left\{ \begin{array}{l} A's \text{ share is } 560 \text{ dollars} \\ B's \quad \quad \quad 480 \\ C's \quad \quad \quad 960 \end{array} \right.$

Compound Partnership

3. A and B join stock in trade
A put in 600 dollars on the first
of January. B advanced on
the first of April a sum
which entitled him to an equal
share of the profit at the end of
the year: required the sum B
put in. Ans. 800 dollars

$$\begin{array}{r} \text{A} \quad \text{D} \quad \text{A} \\ 12 : 600 :: 4 \\ 12 \\ 9 \overline{) 4200} \quad (800 \text{ Ans} \\ \underline{36} \\ 60 \end{array}$$

11. A put in stock 1500 dollars: & at
the end of 12 months agreed to
draw such a sum as at the end of
the year will entitle him to an
equal share of the profits: what
sum must C advance:

$$\begin{array}{r} \text{A} \quad \text{D} \quad \text{A} \\ 12 : 1500 :: 8 \\ 12 \\ 8 \overline{) 21600} \quad (2700 \text{ Ans} \\ \underline{16} \\ 56 \\ \underline{56} \\ 00 \end{array}$$

5. Two gentlemen A and B. hired a
carriage in pittsburgh to go to
philadelphia and return for 160 dol-
lars. with liberty to take in two
others by the way. when at philadel-
phia they took in C. and after wards
100 miles from pittsburgh they
took in D. Now allowing it to be
300 miles from pittsburgh to
philadelphia and also that each man
pays in proportion to the distance
he rode: it is required to tell how
much each must pay:

$$\begin{array}{r} \text{A} \quad 600 \\ \text{B} \quad 600 \\ \text{C} \quad 300 \\ \text{D} \quad 100 \\ 1600 : 160 :: 600 \\ 1600 \overline{) 96000} \quad (60 \text{ A} \\ \underline{9600} \quad 60 \text{ B} \\ 30 \text{ C} \\ 10 \text{ D} \\ 160 \text{ Proof} \\ 1600 : 160 :: 300 \\ 1600 \overline{) 48000} \quad (30 \text{ C} \\ \underline{4800} \quad 0 \end{array}$$

$$\begin{array}{r} 1600 : 160 :: 100 \\ 1600 \overline{) 16000} \quad (10 \text{ D} \\ \underline{1600} \quad 0 \\ \text{Ans} \left\{ \begin{array}{l} \text{A pays 60 dollars} \\ \text{B} \quad 60 \\ \text{C} \quad 30 \\ \text{D} \quad 10 \\ \hline 160 \text{ proof.} \end{array} \right. \end{array}$$

Profit And Loss

Section 10. §§§

2. Bought a piece of cloth for 1 dollar and 20 cents per yard, and sold it again for 1 dollar 50 cents a yard: what is the gain per cent.

Ans 25 per cent.

$$\begin{array}{r} 150 \\ 120 \\ \hline 120 : 30 :: 100 \\ 120 \overline{) 3000} \quad 25 \text{ Ans} \\ \underline{240} \\ 600 \\ 600 \end{array}$$

3. Bought a piece of linen containing 12 yards for 21 dollars and sold it at 66 cents per yard; what is the gain or loss on the whole piece:

Ans. 6 dolls. 42 cts gain.

Yards 12 Dollars 21

$$\begin{array}{r} 1 : 66 :: 12 \\ \hline 132 \\ 264 \\ \hline 2772 \\ 21 \\ \hline 6,72 \text{ Ans} \end{array}$$

4. A merchant bought 6 barrels of whiskey containing 32 gallons each for 96 dollars; while in his possession he lost 12 gallons by leakage. the residue he sold for such a sum as gained him 12 dollars. the residue he sold for such a sum as gained him 12 dollars on the whole. how much per gallon did he buy and sell for:

$$\begin{array}{r} 96 \\ 32 \\ \hline 192 : 96 :: 1 \\ 9600 \quad 50 \text{ Ans} \\ \hline 9600 \end{array}$$

$$\begin{array}{r} 192 \\ 12 \\ \hline 180 : 108 :: 1 \\ 180 \overline{) 1800} \quad 60 \text{ Ans} \\ \hline 1080 \end{array}$$

5. Bought 120 dozen of knives for 20 cents each knife. and sold them again for 14 cents each. what was the loss on the whole: Ans. 13 dolls. 20 cts.

$$\begin{array}{r} 20 \\ 14 \\ \hline 1 : 3 :: 1440 \\ \hline 43,20 \text{ Ans} \end{array}$$

Profit And Loss

6. A merchant gave 119 dollars for 100 yards of cloth at how much per yard must he sell it to gain 51 dollars on the whole.

Ans. 2 dollars.

yards 7 yards

100 : 200 :: 1

100 $\overline{) 200}$ 2 Ans

$$\begin{array}{r} 6 \\ 90 \\ 20 \\ \hline 100 : 120 :: 90 \\ 100 \overline{) 10800} \quad 108 \text{ Ans} \\ \underline{100} \\ 800 \\ \underline{800} \end{array}$$

$$\begin{array}{r} 108 \\ 90 \\ \hline 1 : 18 :: 210 \\ 18 \end{array}$$

$$\begin{array}{r} 1920 \\ 240 \\ \hline 43,20 \text{ Ans} \end{array}$$

7. Bought a chest of tea at 1 dollar and 25 cents per pound. but finding it to be of an inferior quality. I am willing to lose 18 percent. by it; how must I sell it per pound.

Ans. 1 doll. 2 1/2 cts. per lb.

$$\begin{array}{r} 100 \\ 18 \\ \hline 100 : 82 :: 125 \\ 82 \end{array}$$

$$\begin{array}{r} 250 \\ 1000 \\ \hline 100 \overline{) 10250} \\ \underline{1000} \\ 250 \text{ Ans} \end{array}$$

9. A trader bought a hogs head of rum of a certain proof containing 115 gallons. at 1 dollar 10 cents per gallon; how many gallons of water must he put into it to gain 5 dollars. by selling it at 1 dollar per gallon.

Ans. 16 1/2 gallons.

$$\begin{array}{r} 110 \\ 100 \\ \hline 1 : 10 :: 115 \\ 10 \end{array}$$

$$\begin{array}{r} 1150 \\ 5 \\ \hline 100 : 1 :: 16,50 \\ 100 \overline{) 1650} \quad 16.5 \text{ Ans} \\ \underline{100} \\ 650 \\ \underline{600} \\ 500 \end{array}$$

8. A merchant bought 10 dozen of wool hats at 90 cents per hat: at what rate must he sell them again to gain 20 per cent. and how much does he gain on the whole.

Ans. he must sell at 1 doll. 8 cts per hat. and gains 12 dolls 20 cts

SS

Profit And Loss

10. A merchant bought a hundred weight of coffee for 134 dollars and no cents, and was afterwards obliged to sell it at 25 cents per pound: what was his loss on the whole and how much on each pound? Ans. 5 cents loss on each pound, and 22 dolls. 40 cts. on the whole.

$$\begin{array}{r} \text{ll} \quad \text{D} \quad \text{C} \quad \text{ll} \\ \text{Ans: } 134.40 :: 1 \\ \quad \quad 1344 \quad 30 \\ \quad \quad \quad 0.25 \\ \hline \quad \quad \quad 5 \text{ Ans} \end{array}$$

$$\begin{array}{r} \text{ll} \\ 1 : 5 :: 1148 \\ \hline 22.40 \text{ Ans} \end{array}$$

11. If by selling 360 yards of broad cloth for 1428 dollars, there is gained 20 per cent. profit, what did it cost per yard? Ans. 4 dollars.

$$\begin{array}{r} \text{D} \quad \text{D} \quad \text{D} \\ 120 : 100 :: 1428 \\ \quad \quad 100 \\ 120 \overline{) 14280} \quad 1140 \text{ first cost} \\ \quad \underline{120} \\ \quad 528 \\ \quad \underline{480} \\ \quad \quad 480 \\ \quad \quad \underline{480} \\ \quad \quad \quad 0 \end{array}$$

$$\begin{array}{r} \text{yards} \quad \text{D} \\ 360 : 1140 :: 1 \\ \hline 1140 \text{ Ans} \end{array}$$

12. A merchant laid out 1000 dollars on cloth, at 4 dollars per yard, and sold it again at 4 dollars 90 cents per yard, what was his whole gain? Ans. 225 dolls.

$$\begin{array}{r} \text{D} \quad \text{yard} \quad \text{D} \\ 4 : 1 :: 1000 \\ \hline \quad \quad 250 \\ \text{yard} \quad \text{C} \\ 1 : 90 :: 250 \\ \hline \quad \quad 90 \\ 225.00 \text{ Ans} \end{array}$$

13. A sells a quantity of wheat 1 dollar per bushel, and gains 20 per cent; shortly after he sold of the same to the amount of 34 dollars 50 cents, and gained 50 per cent: how many bushels were there in the last parcel, and at what rate did he sell it per bushel? Ans. 30 bushels, at 1 doll. 25 cts. per bushel.

$$\begin{array}{r} \text{C} \quad \text{C} \quad \text{C} \\ 120 : 100 :: 100.00 \\ \quad \quad 100.00 \\ 120 \overline{) 10000} \\ \quad \underline{120} \\ \quad 80 \\ \quad \underline{120} \\ \quad \quad 80 \end{array}$$

$$100 : 150 :: 83\frac{1}{3} \text{ first cost}$$

$$\begin{array}{r} 120 \overline{) 10000} \\ \quad \underline{120} \\ \quad 80 \\ \quad \underline{120} \\ \quad \quad 80 \\ \quad \quad \underline{120} \\ \quad \quad \quad 80 \end{array}$$

$$\begin{array}{r} \text{D} \quad \text{Bu} \quad \text{D} \\ 125 : 1 :: 3750 \text{ 30 bushels sold} \\ \hline \quad \quad 3750 \end{array}$$

P

Profit and Loss

14. A trader is about purchasing 5000 galls. of whiskey, which he can have at 48 cents per gallon in ready money, or 50 cents with 2 months credit; which will be the most profitable, either to pay it on credit, or by borrowing the money at 8 per cent. per annum, to pay the cash price: Ans. He will gain 68 dolls. by paying the cash.

$$\begin{array}{r} \text{G} \quad \text{C} \quad \text{G} \\ 1 : 48 :: 5000 \\ \underline{5000} \\ 2400.00 \\ \underline{3200} \\ 2432 \end{array}$$

$$\begin{array}{r} \text{G} \quad \text{C} \quad \text{G} \\ 1 : 50 :: 5000 \\ \underline{5000} \\ 2500.00 \\ \underline{2432} \end{array}$$

$$\begin{array}{r} \text{M} \quad \text{D} \quad \text{M} \\ 12 : 8 :: 2 \\ \underline{2} \\ 12 \overline{) 16} \\ \underline{12} \\ 4 \end{array}$$

$$\begin{array}{r} \text{D} \quad \text{D} \quad \text{D} \\ 100 : 1\frac{1}{3} :: 2400 \\ \underline{2400} \\ 800 \\ 100 \overline{) 3200} \end{array}$$

15. A butcher bought 12 head of beef cattle of equal weight, for 240 dollars, which he sells again for 11 cents per pound; what ought each one to weigh, that the butcher may have the hide and tallow as clear gain: Ans. each 191.2 lbs.

$$\begin{array}{r} \text{C} \quad \text{L} \quad \text{S} \\ 11 : 1 :: 240.00 \\ \hline 4 \overline{) 24000} \\ \underline{12} \quad 6000 \quad \text{H} \\ \underline{28} \quad 500 \quad \text{H} \quad \text{gr} \quad \text{L} \\ \underline{22} \quad 20 \quad \text{H} = 1 = 2 \text{H} \\ \underline{196} \\ 2 \text{H} \end{array}$$

Barber



Barber

Section II

1. How many yards of linen at 50 cents per yard must be given for 6 1/2 yards of broad cloth at 1 dollar 50 cents per yard.

$$\begin{array}{r} \text{P.L.} \\ 1.50 \text{ dolls} \\ 6\frac{1}{2} \\ \hline 2400 \\ 192\frac{1}{2} \end{array}$$

$$\begin{array}{r} 2812\frac{1}{2} \\ \text{As } 50 : 1 :: 28.12\frac{1}{2} : 56\frac{1}{2} \text{ Ans.} \end{array}$$

2. A has 220 bushels of salt at 1 dollar 20 cents per bushel. for which B agrees to pay him 160 dollars in cash and the rest in coffee at 20 cents per pound: how much coffee must A receive: Ans. 1120 lb.

$$\begin{array}{r} \text{B.L.} \quad \text{B} \\ 1 : 120 :: 320 \\ \hline 120 \\ 6400 \\ 320 \end{array}$$

$$\begin{array}{r} \text{C.L.} \\ 160 \\ 20 : 1 :: 221109 \\ \hline 22400 \\ 1120 \text{ Ans} \end{array}$$

3. How much rye at 40 cents per bushel must be given for 28 bushels of wheat at 1 dollar 25 cents per bushel:

Ans. 50 bushels.

$$\begin{array}{r} \text{B.L.} \quad \text{B} \\ 1 : 125 :: 28 \\ \hline 28 \end{array}$$

$$\begin{array}{r} 1000 \\ \text{C.B. } 250 \\ 40 : 1 :: 3500 \\ \hline 40 \overline{) 3500} \\ \cdot 50 \text{ bushels Ans} \end{array}$$

4. A barterers 319 lb. of coffee at 23 1/2 cents per pound with B for 250 yards of muslin: what does the muslin cost A per yard:

$$\begin{array}{r} \text{C.L.} \quad \text{Ans } 30 \text{ cents nearly} \\ 1 : 23\frac{1}{2} :: 319 \\ \hline 23\frac{1}{2} \end{array}$$

$$\begin{array}{r} 959 \\ 638 \\ 1595 \\ 250 : 74,96.5 :: 1 \\ \hline 250 \overline{) 74,96.5} (299.8 \text{ Ans} \\ 500 \\ 2496 \\ 2250 \\ 2465 \\ 2250 \\ 2150 \\ 2000 \\ 150 \end{array}$$

5. C has flour at 5 dollars per barrel, which he barterers to D at a profit of 20 percent. for tea which cost 1 dollar 25 cents per pound: at what rate must D sell the tea to make the barter equal:

$$\begin{array}{r} \text{Ans. } 1 \text{ doll. } 50 \text{ cts. per lb.} \\ \text{C.L.} \quad \text{D} \\ 100 : 120 :: 6 \\ \hline 100 \overline{) 600} \\ 5 : 6 :: 125 \\ \hline 5 \overline{) 750} \\ 150 \text{ Ans} \end{array}$$

Barter

6. P has 240 bushels of rye which cost him 90 cents per bushel; this he barter with Q at 95 cents per bushel for wheat which stands 99 cents per bushel; how many

6. A has cloth which cost him 2 dollars 50 cents per yard. but in trade he must have 2 dollars 80 cents. B has wheat at 1 dollar 20 cents per bushel; at how much per bushel should he sell to A. to make the barter equal: Ans. 1 doll. 31 1/2 cts

$$\begin{array}{r}
 \text{A} \quad \text{B} \quad \text{C} \\
 250 : 280 :: 120 \\
 \hline
 250 \overline{) 33600} (134 \frac{2}{5} \text{ Ans} \\
 \underline{250} \\
 860 \\
 \underline{450} \\
 1100 \\
 \underline{1000} \\
 1000 \\
 \underline{500} = 2 \\
 \underline{250} = 5
 \end{array}$$

7. P has 240 bushels of rye which cost him 9 cents per bushel; this he barter with Q at 95 cents per bushel for wheat which stands 99 cents per bushel; how many bushels of wheat is he to receive in barter and at what price, that their gains may be equal;

Ans. 218 2/3 bushels at 1 doll 1/2 cents per bushel.

$$\begin{array}{r}
 \text{C} \quad \text{C} \quad \text{C} \\
 90 : 95 :: 99 \\
 \hline
 95 \\
 \underline{495} \\
 891 \\
 90 \overline{) 9405} (104 \frac{1}{2} \text{ price} \\
 \underline{90} \\
 405 \\
 \underline{360} \\
 45 \overline{) 45} = 1 \\
 \underline{90} = 2
 \end{array}$$

$$\begin{array}{r}
 \text{B} \quad \text{C} \quad \text{B} \\
 1 : 95 :: 240 \\
 \hline
 95 \\
 \underline{1200} \\
 2160 \\
 1045 : 1 :: 2280 \text{ or } 218 \frac{2}{3} \text{ Ans} \\
 \underline{2090} \\
 1900 \\
 \underline{1045} \\
 8550 \\
 \underline{8360} \\
 5 \overline{) 190} = 38 \\
 \underline{104.5} = 209
 \end{array}$$

8. A gives B in barter 26 lb. 10 oz. of cinnamon, at 1 dollar 28 cents per pound, for rice at 6 cents per pound: how much rice must A receive: Ans. 5 cwt.

$$\begin{array}{r}
 \text{A} \quad \text{B} \quad \text{C} \text{ oz} \\
 \frac{1}{16} : 128 :: 26 \frac{1}{4} \\
 \hline
 16 \\
 \underline{160} \\
 26 \\
 \underline{420} \\
 128 \\
 \underline{128} \\
 3360 \\
 \underline{3360} \\
 480 \\
 \underline{480} \\
 16 : 1 :: 539 \frac{1}{2} (33.60 \\
 \underline{48} \\
 57 \\
 \underline{48} \\
 96
 \end{array}$$

$$\begin{array}{r}
 \text{C} \quad \text{A} \quad \text{C} \\
 6 : 1 :: 3360 \\
 \hline
 3360 \\
 28 \overline{) 5600} (120 \\
 \underline{560} \\
 0 \quad 5 \text{ Ans}
 \end{array}$$

S. Barber James

9. And Charter: C has muslin that cost him 22 cents per yard. and he puts it at 25 cents: C cost him 28 cents per yard. at what price must he put it to gain 10 per cents. more than C: Ans 35 cents per yard.

$$\begin{array}{r} C \quad C \quad C \\ 100 : 125 :: 28 \end{array}$$

$$\begin{array}{r} 100 \\ 25 \\ \hline 3500 \end{array} \quad \begin{array}{l} 25 \text{ cts per yard} \\ 500 \\ \hline 500 \end{array}$$

$$\begin{array}{r} C \quad C \quad C \\ 1 : 30 :: 1148 \\ \hline 13410 \end{array}$$

$$\begin{array}{r} C \quad C \quad C \\ 1 : 175 :: 64 \\ \hline 1050 \\ 11200 \end{array}$$

$$\begin{array}{r} \text{yard} \quad \text{yards} \\ 1 : 6 :: 25 \\ \hline 150 \end{array}$$

$$\begin{array}{r} 134110 \\ 11200 \\ 150 \\ \hline 20610 \\ 60250 \end{array}$$

$$\begin{array}{r} C \quad B \quad C \\ 8 : 1 :: 960 \\ \hline 120 \text{ barrels Ans} \end{array}$$

$$\begin{array}{r} 10 \text{ } | \text{ } 25 \\ \hline 25 \\ 22 : 27.5 :: 28 \\ \hline 2200 \\ 550 \\ \hline 22570.00 \end{array} \quad \begin{array}{l} 35 \text{ cts per yard} \\ 66 \\ \hline 110 \\ 110 \end{array}$$

S. Barber

10. A buys 250 barrels of flour from B at 6 dollars 25 cents per barrel, in pay ment B takes 100 lbs of coffee at 30 cents per pound, 6 lbs of tea at 1 dollar 45 cents per lb. 25 yards of broad cloth at 6 dollars per yard, 206 dollars 10 cents in cash. and the balance in salt. at 8 dollars per barrel: how many barrels of salt must B receive:

Ans. 120 barrels

$$\begin{array}{r} C \quad C \quad C \\ 1 : 625 :: 250 \end{array}$$

$$\begin{array}{r} 31250 \\ 1250 \\ \hline 156250 \\ 60250 \\ \hline 96000 \end{array}$$

Exchange

Question
 Case 1. *Ans*

1. What is the value of 1800l. Pennsylvania currency in North Carolina

$$\begin{array}{r}
 \text{Pd } \$ \quad \text{f} \\
 18 : 8 :: 1800 \\
 \hline
 20 \\
 9600 \\
 \hline
 115200 \\
 96 \overline{) 115200} \\
 \hline
 102400 \\
 20 \overline{) 102400} \\
 \hline
 512 \text{ Ans}
 \end{array}$$

2 What is the value of 256l. New York currency in Pennsylvania: *Ans* 240l.

$$\begin{array}{r}
 \$ \quad \text{Pd } \$ \quad \text{f} \\
 8 : 46 :: 256 \\
 \hline
 12 \quad 20 \\
 90 \quad 5120 \\
 \hline
 8 \overline{) 460800} \\
 12 \overline{) 54600} \\
 20 \overline{) 4800} \\
 \hline
 240 \text{ Ans}
 \end{array}$$

3 How much South Carolina currency is equal to 1500l. of New Jersey *Ans* 933l 6s 8d.

$$\begin{array}{r}
 \text{Pd } \$ \quad \text{Pd } \$ \quad \text{f} \\
 46 : 48 :: 1500 \\
 \hline
 12 \quad 20 \\
 90 \quad 56 \quad 30000 \\
 \hline
 360000 \\
 \hline
 2160000 \\
 1800000 \\
 \hline
 96 \overline{) 20160000} \\
 12 \overline{) 224000} \\
 20 \overline{) 1866668} \\
 \hline
 933 = 6 = 8 \text{ Ans}
 \end{array}$$

4. What sum New York currency is equal to 180l. in Massachusetts. *Ans* 240l.

$$\begin{array}{r}
 \$ \quad \text{Pd } \$ \quad \text{f} \\
 6 : 8 :: 180 \\
 \hline
 20 \\
 3600 \\
 \hline
 6 \overline{) 28800} \\
 20 \overline{) 4800} \\
 \hline
 240 \text{ Ans}
 \end{array}$$

5. How much Virginia currency will purchase a bill for 280l. South Carolina. *Ans* 360l.

$$\begin{array}{r}
 \text{Pd } \$ \quad \text{Pd } \$ \quad \text{f} \\
 48 : 6 :: 280 \\
 \hline
 12 \quad 20 \\
 56 \quad 5600 \\
 \hline
 67200 \\
 \hline
 56 \overline{) 403200} \\
 392 \quad 112 \\
 \hline
 112 \\
 \hline
 20 \overline{) 7200} \\
 \hline
 360 \text{ Ans}
 \end{array}$$

Exchange Example

6. A bill of exchange being remitted from Rhode Island to South

Carolina for 3111. what is its value in the currency of the latter. Ans 236l. 8s. 10½d.

$$\begin{array}{r} \text{£} \quad \text{s} \quad \text{d} \\ 6 : 118 :: 3011 \\ \hline 56 \end{array}$$

$$\begin{array}{r} 36480 \\ 30400 \\ \hline 6340480 \\ 12) 567116 = 2 \\ 20) 4728 = 10 \\ \hline 236 = 8 = 10\frac{1}{2} \end{array}$$

Case 2.

1. Change 124l. 12s. New England money to dollars and cents.

$$124\text{l. } 12\text{s} = 2552 \text{ shillings.}$$

The dollar. New England is

$$65) 2552 \\ \hline 125,33\frac{1}{3} \text{ Ans. } 125 \text{ dollars } 33\frac{1}{3}$$

2. Change 34l. 10s. Pennsylvania currency. to dollars.

$$\begin{array}{r} \text{£} \quad \text{s} \\ 34 \quad 10 \\ \hline 20 \\ \hline 750 \\ 12 \\ \hline 9) 9000 \\ \hline 100,00 \text{ Ans} \end{array}$$

3. Change 225l. 12s. New York currency to federal money.

$$225\text{l. } 12\text{s} = 4512 \text{ shillings} \div 8 \text{ the dollar New York currency} = 564 \text{ dollars. Ans.}$$

$$\begin{array}{r} \text{£} \quad \text{s} \\ 225 \quad 12 \\ \hline 20 \\ \hline 8) 4512 \\ \hline 564 \text{ Ans} \end{array}$$

4. A bill of exchange for 1168l. 19s. 6d. Virginia currency is remitted to Philadelphia. what is its value in federal money. Ans. 1563 dollars 25 cts.

$$\begin{array}{r} \text{£} \quad \text{s} \quad \text{d} \\ 1168 \quad 19 \quad 6 \\ \hline 20 \\ \hline 9349 \\ 12 \\ \hline 72) 112554 \\ \hline 42 \\ \hline 405 \\ 360 \\ \hline 455 \\ 432 \\ \hline 2311 \\ 216 \\ \hline 180 \\ 144 \\ \hline 360 \\ 360 \end{array}$$

5. A merchant deposited in the United States branch bank at Pittsburgh. the sum of 450l. 10s. Pennsylvania currency. for what sum may he draw for in federal money.

$$\begin{array}{r} \text{£} \quad \text{s} \quad \text{d} \\ 450 \quad 10 \\ \hline 20 \\ \hline 15010 \\ 12 \\ \hline 90) 180120 \\ \hline 180 \\ \hline 120 \\ 90 \\ \hline 300 \\ 240 \\ \hline 300 \\ 240 \\ \hline 30 \end{array}$$

Foreign Exchange C & F

III CASH III

1. Philadelphia is indebted to London 1260 l. currency. what sum sterling must be remitted when the exchange is 65 percent.

$$\begin{array}{r} 165 : 100 :: 1260 : x \\ 165 \overline{) 126000} \\ \underline{1000} \\ 26000 \\ \underline{16500} \\ 95000 \\ \underline{94500} \\ 500 \end{array}$$

2. London is indebted to Philadelphia 1060 l. Sterling what sum Pennsylvania currency must be remitted. the exchange being 65 percent. as above:

$$\begin{array}{r} 100 : 165 :: 1060 : x \\ 165 \overline{) 106000} \\ \underline{10000} \\ 60000 \\ \underline{64500} \\ 55000 \\ \underline{54750} \\ 25000 \\ \underline{24750} \\ 25000 \\ \underline{24750} \\ 25000 \end{array}$$

Baltimore Oct 15 14.

Exchange for 1260 l. 10 s. sterling. thirty days after sight of this my first of exchange second and third of like tenor and date not being paid. pay to Mr. B. or order. twelve hundred and sixty pounds ten shillings sterling value received and place the same to account as per advice from.

W. S. Merchant. London.

What is the value of this bill in Federal money. 1260 l. 10 s. = 12605 + by 44 cents = 5596 dolls. 62 cts.

$$\begin{array}{r} 1 : 44 :: 12605 : x \\ 44 \overline{) 126050} \\ \underline{44000} \\ 82050 \\ \underline{88000} \\ 40500 \\ \underline{44000} \\ 65000 \\ \underline{66000} \\ 10000 \\ \underline{10000} \\ 0 \end{array}$$

Ans 5596,62

Exchange for 5596 dolls 62 cts. Federal money. thirty days after sight of this my second of exchange first and third of the same tenor and date not paid. pay to J. S. or order five thousand five hundred and ninety six dolls sixty two cents value received. and place the same to account as per advice from

S. S. Mr. J. S. Merchant. Baltimore

How much sterling is the above bill. 44 cents to the pound

$$\begin{array}{r} 44 \overline{) 559662} \\ \underline{440000} \\ 119662 \\ \underline{110000} \\ 96620 \\ \underline{88000} \\ 86200 \\ \underline{86200} \\ 0 \end{array}$$

Ans 1260.10

Foreign Exchange Exco

15. A merchant of Philadelphia & In a settlement between A of London receiving from his correspondent B of Philadelphia. B is in Dublin a bill of exchange for indited to A in the sum of 230 £ 540 £. 15 s. Irish currency what sterling what sum must remitted by B to A to settle the balance. the exchange being 12 1/2 per cent from the United States to Great Britain Ans. 1598 dolls. 40 cts.

Ans. 2217 dolls. 7 1/2 cts.

$$\begin{array}{r} \text{£} \quad \text{£} \quad \text{£} \quad \text{£} \\ 1 : 110 :: 540 : 15 \\ \hline 20 \\ 20 \end{array}$$

$$\begin{array}{r} 10818 \\ 110 \\ \hline 108130 \\ 43260 \end{array}$$

$$\begin{array}{r} 210) 44341.50 \\ \hline 221707.5 \end{array} \text{Ans}$$

$$\begin{array}{r} \text{£} \quad \text{£} \\ 320 \quad 1111 \\ 125 \quad 360 \\ \hline 3840 \quad 26640 \\ 166 \quad 1232 \\ \hline 4000 \quad 1598.40 \end{array} \text{Ans}$$

6. A merchant in Philadelphia draws on his correspondent in Dublin for the balance of an account amounting to 2217 dollars 7 1/2 cts. what sum Irish currency must be remitted to satisfy the draft.

Ans. 540 £. 15 s.

$$\begin{array}{r} \text{£} \quad \text{£} \quad \text{£} \quad \text{£} \\ 110 : 1 :: 2217.075 : \end{array}$$

$$\begin{array}{r} 110) 2217.075 \\ \hline 2050 \\ 1640 \\ 1640 \end{array}$$

$$\begin{array}{r} 307.5 \\ 20 \\ \hline 110) 61500(15 \\ 110 \\ \hline 2050 \\ 2050 \end{array}$$

$$\begin{array}{r} \text{£} \quad \text{£} \\ 540 \quad 15 \end{array} \text{Ans}$$

8. C of New York remits 3280 dollars to his correspondent in Dublin to be placed to his account: for what sum Irish currency must he receive credit. the course of exchange being 8 percent in favour of Ireland.

Ans. 136 £. nearly.

$$\begin{array}{r} 3280 \\ 8 \\ \hline 26240 \\ 110) 301760(136 \text{ Ans} \\ 2870 \end{array}$$

$$\begin{array}{r} 1176 \\ 1230 \\ \hline 2460 \\ 2460 \end{array}$$

FF

Alligation

Section 1. Case 1.

1. A merchant mixed 2 gallons of wine at 2 dollars per gallon, 2 at 2 dollars 50 cents, and 2 at 3 dollars: what is one gallon of this mixture worth?

G.

$$2 \text{ at } 2.00 = 400$$

$$2 \text{ at } 2.50 = 500$$

$$2 \text{ at } 3.00 = 600$$

$$\hline 6 \quad 1500$$

$$\text{Ans } 6 : 15,00 :: 1 : 2,50 \text{ Ans.}$$

2. A grocer mixed 20 lb. of sugar at 10 cents per lb. 3 lb. at 15 cents, and 10 lb. at 25 cents; what is one pound of this mixture worth?

ll

$$20 \text{ at } 10 = 200$$

$$3 \text{ at } 15 = 450$$

$$10 \text{ at } 25 = 2500$$

$$\hline 90 \quad 3000$$

ll

$$90 : 3000 :: 1$$

$$90 \overline{) 3000} (33 \frac{1}{3} \text{ Ans}$$

$$\hline 2700$$

$$\hline 300$$

$$3 \overline{) 300} = 100$$

3. A trader mixed 10 bushels of wheat at 150 cents, 20 at 160 cents, and 30 at 170 cents per bushel: at what rate can he afford to sell one bushel of this mixture: Ans. 163 1/3 cents.

B

$$10 \text{ at } 150 = 1500$$

$$20 \text{ at } 160 = 3200$$

$$30 \text{ at } 170 = 5100$$

$$\hline 60 \quad 9800$$

B

ll

B

$$60 : 9800 :: 1$$

$$60 \overline{) 9800} (163 \frac{1}{3} \text{ Ans}$$

$$\hline 3600$$

$$\hline 6200$$

$$\hline 2000$$

$$\hline 1800$$

$$2 \overline{) 1800} = 900$$

4. If 11 ounces of silver at 45 cents per ounce be melted with 8 ounces at 60 cents per ounce, what is the value of one ounce of this mixture: Ans. 65 cents.

oz

ll

$$11 \text{ at } 45 = 495$$

$$8 \text{ at } 60 = 480$$

$$\hline 19 \quad 975$$

oz

ll

oz

$$19 : 975 :: 1$$

$$19 \overline{) 975} (51 \frac{3}{19} \text{ Ans}$$

$$\hline 950$$

$$\hline 25$$

Alligation

Case 2.

1. How many pounds of tea at 150, 160 and 200 cents per pound must be mixed together that one pound may be sold for 180 cents:

Mean rate 180
 150 20 at 150
 160 20 at 160
 200 30 at 200
 50 at 200

150
 20
 3000
 3200
 100
 90: 162.00::1

160
 20
 3200

50
 100

90: 162.00
 1.80 Proof

2. how many gallons of wine at 3, 5, and 6 dollars per gallon, must be mixed together that one gallon may be worth 4 dollars; Ans. 3 gal. at 3 dolls. 1 gal. at 5 dolls. and 1 gallon at 6 dolls

Gal Doll
 3 1+2=3 at 3
 5 1 at 5
 6 1 at 6

3. how many bushels of rye at 40 cents per bushel, and corn at 30 cents, must be mixed with oats at 20 cents, to make a mixture worth 25 cents per bushel:

Bu. cts
 40 5+5=20 at 40
 30 5 at 30
 20 5 at 20

4. A grocer has four several sorts of tea. viz. one kind at 120 cents, another at 110 cents, another at 90 cents, and another at 80 cents per pound. how much of each sort must be taken to make a mixture worth 1 dollar per pound:

1 100 { 120 2
 110 1
 90 1
 80 2 } Ans

2 100 { 120 2+1=3
 110 2
 90 2
 80 2+1=3 } Ans

3 100 { 120 1
 110 2
 90 2
 80 1 } Ans

4 100 { 120 1
 110 2+1=3
 90 1+2=3
 80 1 } Ans

5 100 { 120 2+1=3
 110 1
 90 1+2=3
 80 2 } Ans

6 100 { 120 2
 110 2+1=3
 90 1
 80 2+1=3 } Ans

240

330

90

240

900

1000 Cents

Proof

© Alligation James McCormick 1813

SSS Case 3 SSS

1. A grocer would mix 100 pounds of sugar at 22 cents per pound with some at 20, 14, and 12 cents per pound. how much of each sort must he take to mix with the 100 pounds that he may sell the mixture at 18 cents per pound:

$$\begin{array}{r} 12 \\ 14 \\ 18 \end{array} \left\{ \begin{array}{l} 11 \\ 2 \\ 4 \end{array} \right. \begin{array}{l} 11 \\ 2 \\ 4 \end{array}$$

$$6 : 110 :: 11$$

$$6 \overline{) 160} \begin{array}{l} 26.66 \text{ lb. at } 12 \text{ cts and } 20 \end{array}$$

$$\begin{array}{r} 12 \\ 40 \\ 36 \\ 40 \\ 36 \\ 11 \end{array}$$

$$6 : 40 :: 2$$

$$6 \overline{) 80} \begin{array}{l} 13.33 \text{ lb. at } 14 \text{ cents} \end{array}$$

$$\begin{array}{r} 20 \\ 18 \\ 20 \\ 18 \\ 20 \\ 18 \\ 2 \end{array}$$

2. How much wheat at 18 cents, rye at 36 cents, and barley at 30 cents per bushel must be mixed with 24 bushels of oats at 18 cents per bushel that the whole may rate at 22 cents per bushel: Ans. 2 bushels of each.

$$\begin{array}{r} 18 \\ 36 \\ 22 \end{array} \left\{ \begin{array}{l} 26 \\ 14 \\ 8 \end{array} \right. = 48$$

$$118 : 24 :: 11$$

$$118 \overline{) 96} \begin{array}{l} 2 \text{ bushels of each} \end{array}$$

3. How much gold at 16, 20, and 24 carats fine, and how much alloy must be mixed with 10 ounces of 18 carats fine, that the composition may be 22 carats fine:

Ans. 1003 of 16 carats fine, 10 of 20 140 of 24 and 10 of alloy.

$$\begin{array}{r} 16 \\ 18 \\ 20 \\ 22 \end{array} \left\{ \begin{array}{l} 2 \\ 2 \\ 2 \\ 2 \end{array} \right. \begin{array}{l} 2 \\ 2 \\ 2 \\ 2 \end{array}$$

$$22 \overline{) 20} \begin{array}{l} 2 \\ 2 \\ 2 \\ 2 \end{array}$$

$$22 \overline{) 20} \begin{array}{l} 2 \\ 2 \\ 2 \\ 2 \end{array}$$

$$2 : 10 :: 2$$

$$2 \overline{) 20} \begin{array}{l} 1003 \end{array}$$

$$2 : 10 :: 34$$

$$2 \overline{) 340} \begin{array}{l} 170 \end{array}$$

Alligation Last

Case 4.

1. How much sugar a 10. 12, and 15 cents per pound. will be required make a mixture of 40 pounds worth 13 cents per pound:

$$\begin{array}{r} 10 \\ 12 \\ 15 \end{array} \begin{array}{r} 2 \\ 2 \\ 3+1=4 \end{array}$$

Sum of the different simples.

Ans $8:40::2$
 $\frac{80}{10} \text{ lb.}$

Ans $8:40::4$
 $\frac{160}{20} \text{ do.}$

Ans $8:40::2$
 $\frac{80}{10} \text{ do.}$

2. How much gold of 15. of 17. of 18, and of 22 carats fine. must be mixed together to form a mixture of 40 ounces of 20 carats fine: Ans. 503. of 15. of 17. and of 18. and 2503. of 22.

$$\begin{array}{r} 15 \\ 17 \\ 18 \\ 22 \end{array} \begin{array}{r} 2 \\ 2 \\ 2 \\ 5+3+2=10 \end{array}$$

$16:40::2$
 $\frac{80}{80} \text{ 503. of}$

$16:40::10$
 $\frac{400}{32} \text{ 2503 of}$
 $\frac{80}{80}$

3. How many gallons of water must be mixed with wine at 6 dollars per gallon. to fill a vessel 70 gallons. so that it may be sold without loss. at 5 dollars per gallon:

Ans. $11\frac{2}{3}$ gallons of water.

Id
 $5 \left\{ \begin{array}{l} 6 \\ 5 \end{array} \right\} \frac{5}{6}$

Ans $6:70::1$
 $\frac{70}{6} 11\frac{2}{3} \text{ Ans}$
 $\frac{10}{6} = \frac{5}{3}$
 $\frac{2}{6} = \frac{1}{3}$

a
Last

vulgar fractions

III Case 1. III

1. Reduce $\frac{26}{48}$ to its lowest terms.

$$\begin{array}{r} 36) 48(1 \\ \underline{36} \\ 12) 36(3 \\ \underline{36} \\ 12) 48(4 \\ \underline{48} \end{array} \quad \frac{3}{4} \text{ Ans}$$

2. Reduce $\frac{144}{216}$ to its lowest terms. Ans. $\frac{2}{3}$

$$\begin{array}{r} 144) 216(1 \\ \underline{144} \\ 72 \\ 72) 144(2 \\ \underline{144} \\ 72) 216(3 \\ \underline{216} \end{array} \quad \frac{2}{3} \text{ Ans}$$

3. Reduce $\frac{75}{125}$ to its lowest terms. Ans. $\frac{3}{5}$

$$\begin{array}{r} 75) 125(1 \\ \underline{75} \\ 50) 75(1 \\ \underline{50} \\ 25) 125(5 \\ \underline{125} \\ 25) 75(3 \\ \underline{75} \end{array} \quad \frac{3}{5} \text{ Ans}$$

4. Reduce $\frac{4800}{10800}$ to its lowest terms. Ans. $\frac{4}{9}$

$$\begin{array}{r} 4800) 10800(2 \\ \underline{9600} \\ 12) 4800(4 \\ \underline{4800} \\ 12) 10800(9 \\ \underline{10800} \end{array} \quad \frac{4}{9} \text{ Ans}$$

5. Reduce $\frac{91}{117}$ to its lowest terms. Ans. $\frac{7}{9}$

$$\begin{array}{r} 91) 117(1 \\ \underline{91} \\ 26) 91(3 \\ \underline{78} \\ 13) 117(9 \\ \underline{117} \\ 13) 91(7 \\ \underline{91} \end{array} \quad \frac{7}{9} \text{ Ans}$$

6. Reduce $\frac{4846}{88884}$ to its lowest terms. Ans. $\frac{1}{9}$

$$\begin{array}{r} 4846) 88884(19 \\ \underline{88884} \end{array}$$

III Case 2. III

HB

Reduction of vulgar fractions

1. Reduce $8\frac{3}{4}$ to an improper fraction.

$$\begin{array}{r} 8 \\ 4 \\ \hline 32 + 3 = 35 \\ \hline 4 \end{array} \text{Ans}$$

III CASE 3. III

1. Reduce $\frac{35}{4}$ to its proper terms.

$$\begin{array}{r} 14) 35 (8\frac{3}{4} \text{Ans} \\ 32 \\ \hline 3 \end{array}$$

2. Reduce $12\frac{15}{19}$ to an improper fraction. Ans. $\frac{219}{19}$

$$\begin{array}{r} 12 \\ 19 \\ \hline 54 \\ 12 \\ \hline 204 + 15 = 219 \\ \hline 19 \end{array} \text{Ans}$$

2. Reduce $\frac{3848}{21}$ to its proper terms. Ans $183\frac{5}{21}$

$$\begin{array}{r} 21) 3848 (183\frac{5}{21} \text{Ans} \\ 174 \\ \hline 168 \\ \hline 68 \\ 63 \\ \hline 5 \end{array}$$

3. Reduce $183\frac{5}{21}$ to an improper fraction. $\frac{3848}{21}$ Ans

$$\begin{array}{r} 183 \\ 21 \\ \hline 183 \\ 366 \\ \hline 3843 + 5 = 3848 \\ \hline 21 \end{array} \text{Ans}$$

3. Reduce $\frac{2465}{7}$ to its proper terms.

$$\begin{array}{r} 7) 2465 \text{Ans } 352\frac{1}{7} \\ 352\frac{1}{7} \text{Ans} \end{array}$$

4. Reduce $514\frac{5}{16}$ to an improper fraction. $\frac{8229}{16}$ Ans

$$\begin{array}{r} 514 \\ 16 \\ \hline 3084 \\ 514 \\ \hline 8224 + 5 = 8229 \\ \hline 16 \end{array} \text{Ans}$$

4. Reduce $\frac{961}{17}$ to its proper terms. Ans $56\frac{9}{17}$

$$\begin{array}{r} 17) 961 (56\frac{9}{17} \text{Ans} \\ 85 \\ \hline 111 \\ 102 \\ \hline 9 \end{array}$$

5. Reduce $68425\frac{3}{4}$ to an improper fraction. $\frac{273703}{4}$ Ans

$$\begin{array}{r} 68425 \\ 4 \\ \hline 273700 + 3 = 273703 \\ \hline 4 \end{array} \text{Ans}$$

5. Reduce $\frac{8229}{16}$ to its proper terms. Ans $514\frac{5}{16}$

$$\begin{array}{r} 16) 8229 (514\frac{5}{16} \text{Ans} \\ 80 \\ \hline 22 \\ 16 \\ \hline 69 \\ 64 \\ \hline 5 \end{array}$$

Reduction of Vugar Fractions

| | |
|-------|-------|
| 1/2 | 1/2 |
| 1/3 | 1/3 |
| 1/4 | 1/4 |
| 1/5 | 1/5 |
| 1/6 | 1/6 |
| 1/7 | 1/7 |
| 1/8 | 1/8 |
| 1/9 | 1/9 |
| 1/10 | 1/10 |
| 1/11 | 1/11 |
| 1/12 | 1/12 |
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| 1/93 | 1/93 |
| 1/94 | 1/94 |
| 1/95 | 1/95 |
| 1/96 | 1/96 |
| 1/97 | 1/97 |
| 1/98 | 1/98 |
| 1/99 | 1/99 |
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Journal of the [illegible] [illegible]

100 miles

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Reduction of Vulgar Fractions

Case 4.

1 Reduce $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$ to a common denominator.

$$\begin{array}{l} 1 \times 3 \times 4 = 12 \\ 2 \times 2 \times 4 = 16 \\ 3 \times 2 \times 3 = 18 \\ 2 \times 3 \times 4 = 24 \end{array} \left. \begin{array}{l} \text{numerators} \\ \text{common denominator} \end{array} \right\} \text{for}$$

Ans. $\frac{12}{24}, \frac{16}{24}, \frac{18}{24}$

2 Reduce $\frac{3}{4}, \frac{4}{5}, \frac{5}{6}$ to a common denominator.

Ans. $\frac{90}{120}, \frac{96}{120}, \frac{100}{120}$

$$\begin{array}{l} \frac{3}{4} \times \frac{4}{5} \times \frac{5}{6} \\ 3 \times 5 \times 6 = 90 \\ 4 \times 4 \times 6 = 96 \\ 5 \times 4 \times 5 = 100 \\ 4 \times 5 \times 6 = 120 \end{array}$$

$\frac{90}{120}, \frac{96}{120}, \frac{100}{120}$ Ans

3 Reduce $\frac{1}{3}, \frac{2}{5}, \frac{3}{7}$ to a common denominator.

$$\begin{array}{l} 1 \times 5 \times 15 \times 9 = 675 \\ 3 \times 3 \times 15 \times 9 = 1215 \\ 4 \times 3 \times 5 \times 9 = 540 \\ 5 \times 3 \times 5 \times 15 = 1125 \\ 3 \times 5 \times 15 \times 9 = 2025 \end{array}$$

$\frac{675}{2025}, \frac{1215}{2025}, \frac{540}{2025}, \frac{1125}{2025}$ Ans

Case 5.

PL

1 Reduce $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}$ to the least common denominator.

$$\begin{array}{r} 3 \overline{) 2368} \\ \underline{2128} \\ 1114 \times 2 \times 3 = 24 \end{array}$$

Divisors $\left\{ \begin{array}{l} 24 \\ 3 \quad 12 \times 1 = 12 \\ 6 \quad 8 \times 2 = 16 \\ 8 \quad 4 \times 5 = 20 \\ 3 \times 7 = 21 \end{array} \right.$

Then $\frac{12}{24}, \frac{16}{24}, \frac{20}{24}, \frac{21}{24}$ Ans.

2 Reduce $\frac{2}{3}, \frac{3}{8}, \frac{4}{12}, \frac{5}{20}$ to the least common denominator.

$$\begin{array}{r} 4 \overline{) 381220} \\ 3 \overline{) 3235} \\ \underline{1215} \\ 1030 \\ \underline{30} \\ 120 \end{array}$$

Divisors $\left\{ \begin{array}{l} 80 \times 2 = 80 \\ 8 \times 15 \times 3 = 145 \\ 12 \times 10 \times 4 = 140 \\ 20 \times 6 \times 5 = 30 \end{array} \right.$

$\frac{80}{120}, \frac{145}{120}, \frac{140}{120}, \frac{30}{120}$ Ans

3 Reduce $\frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \frac{4}{9}$ to the least common denominator.

$$\begin{array}{r} 3 \overline{) 35159} \\ \underline{1553} \\ 11135 \\ \underline{15} \\ 15 \end{array}$$

Divisors $\left\{ \begin{array}{l} 15 \times 1 = 15 \\ 5 \times 9 \times 3 = 27 \\ 15 \times 3 \times 4 = 12 \\ 9 \times 5 \times 5 = 25 \end{array} \right.$

$\frac{15}{45}, \frac{27}{45}, \frac{12}{45}, \frac{25}{45}$ Ans

Sugar Fractions 52

Case 6.

1. Reduce $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ to a single fraction.

$$\begin{array}{l} 2 \times 3 \times 4 = 24 \\ 3 \times 4 \times 5 = 60 \\ \hline \frac{24}{60} = \frac{2}{5} \text{ Ans} \end{array}$$

Of cancelled

$$\frac{2 \cancel{3} \cancel{4}}{3 \cancel{4} 5} = \frac{2}{5} \text{ Ans}$$

2. Reduce $\frac{7}{8}$ of $\frac{4}{6}$ of $\frac{9}{10}$ to a single fraction.

$$\begin{array}{l} 7 \times 4 \times 9 = 252 \\ 8 \times 6 \times 10 = 480 \\ \hline \frac{252}{480} = \frac{21}{40} \text{ Ans} \end{array}$$

3. Reduce $\frac{5}{7}$ of $\frac{4}{8}$ of $\frac{3}{4}$ to a single fraction.

$$\begin{array}{l} 5 \times 4 \times 3 = 60 \\ 7 \times 8 \times 4 = 224 \\ \hline \frac{60}{224} = \frac{15}{56} \text{ Ans} \end{array}$$

4. Reduce $\frac{5}{9}$ of $\frac{4}{7}$ of $\frac{11}{12}$ to a single fraction.

$$\begin{array}{l} 5 \times 4 \times 11 = 220 \\ 9 \times 7 \times 12 = 756 \\ \hline \frac{220}{756} = \frac{55}{189} \text{ Ans} \end{array}$$

Case 7.

1. Reduce $\frac{5}{6}$ of a penny to the fraction of a pound.

$$\frac{5 \times 1 \times 1}{6 \times 12 \times 20} = \frac{5}{1440} = \frac{1}{288} \text{ Ans.}$$

2. Reduce $\frac{4}{5}$ of a penny weight to the fraction of a pound troy.

$$\frac{4 \times 1 \times 1}{5 \times 20 \times 12} = \frac{4}{1200} = \frac{1}{300} \text{ Ans.}$$

3. Reduce $\frac{9}{13}$ of a pint of wine to the fraction of a hogs head.

$$\frac{9 \times 1}{13 \times 504} = \frac{9}{6552} = \frac{1}{728} \text{ Ans}$$

4. Reduce $\frac{10}{11}$ of a minute to the fraction of a day.

$$\frac{10 \times 1}{11 \times 1440} = \frac{10}{15840} = \frac{1}{1584} \text{ Ans}$$

Cases.

2
2
2

2
2
2

2
2
2

Reduction of Vulgar fractions 8

1. Reduce $\frac{5}{1120}$ of a pound to the fraction of a penny.

$$\begin{array}{r} 20 \\ 12 \\ \hline 240 \\ 5 \\ \hline 12 \overline{) 1200} \text{ @ } \frac{10}{12} = \frac{5}{6} \text{ Ans} \\ \underline{1120} \end{array}$$

2. Reduce $\frac{1}{300}$ of a pound troy to the fraction of a penny weight.

$$\begin{array}{r} 12 \\ 20 \\ \hline 240 \\ 6 \overline{) 300} = \frac{4}{5} \text{ Ans} \end{array}$$

3. Reduce $\frac{1}{428}$ of a hog shead to the fraction of a pint. Ans. $\frac{7}{13}$

$$\begin{array}{r} 63 \\ 4 \\ \hline 252 \\ 2 \\ \hline 504 \\ 8 \overline{) 504} \text{ @ } \frac{63}{91} = \frac{9}{13} \text{ Ans} \\ \underline{428} \end{array}$$

4. Reduce $\frac{1}{1584}$ of a day to the fraction of a minute. Ans. $\frac{10}{11}$

$$\begin{array}{r} 24 \\ 60 \\ \hline 1440 \\ 6 \overline{) 1440} \text{ @ } \frac{240}{264} = \frac{10}{11} \text{ Ans} \\ \underline{1584} \end{array}$$

Case 9.

ZZZ

1. What is the value of $\frac{2}{3}$ of a pound sterling

$$\begin{array}{r} 20 \text{ shilling} = 1 \text{ pound} \\ 2 \\ \hline 3 \overline{) 40} \\ \underline{30} \\ 10 \end{array} \text{ Ans. } 13 \text{ s. } 4 \text{ d.}$$

2. Reduce $\frac{2}{3}$ of a pound troy to proper quantity. Ans. 40 z. 12 dwts

$$\begin{array}{r} 12 \\ 3 \\ \hline 5 \overline{) 36} \\ \underline{30} \\ 6 \end{array} \text{ 40 z. 12 dwts. Ans.}$$

3. Reduce $\frac{4}{5}$ of a mile to its proper quantity. Ans. 6 fur. 16 p.

$$\begin{array}{r} 8 \\ 4 \\ \hline 5 \overline{) 32} \\ \underline{25} \\ 7 \end{array} \text{ 6 fur. 16 p. Ans.}$$

4. Reduce $\frac{8}{10}$ of a day to its proper time.

$$\begin{array}{r} 24 \\ 3 \\ \hline 10 \overline{) 72} \\ \underline{70} \\ 2 \end{array} \text{ 7 h. 12 mi. Ans.}$$

5. What is the value of $\frac{4}{5}$ of a dollar. Ans. 80 cts.

$$\begin{array}{r} 100 \\ 4 \\ \hline 5 \overline{) 400} \\ \underline{320} \\ 80 \end{array} \text{ 80 cts Ans}$$

III Case 10. III

Z D

Reduction of Vulgar fractions

Case 11.

1. Reduce 6s. 8d. to the fraction of a pound

| | | |
|----|-----|-------------------|
| s. | d. | |
| 6 | 8 | |
| | 12 | |
| 80 | 240 | $\frac{1}{3}$ Ans |

1. Reduce $\frac{3}{4}$ to a decimal fraction of the same value

$\frac{300}{400} = .75$ Ans.

2. Reduce 25 cents to the fraction of a dollar.

$\frac{25}{100} = \frac{1}{4}$ Ans

2. Reduce $\frac{17}{20}$ to a decimal fraction. Ans. .85.

$\frac{170}{200} = .85$ Ans

3. Reduce 31 gallons 2 quarts to the fraction of a hogs head. Ans. $\frac{1}{2}$.

| | | |
|-----|-----|--------------------|
| gal | qt | |
| 31 | 2 | |
| | 4 | |
| 126 | 252 | $\frac{1}{2}$ Ans. |

4. Reduce 6 hundred weight 2 quarters 18 $\frac{2}{3}$ pounds to the fraction of a ton. Ans. $\frac{1}{3}$.

| | | | |
|------|----|------------------|-------------------|
| cwt | qr | lb | |
| 6 | 2 | 18 $\frac{2}{3}$ | |
| | | 4 | |
| 24 | | | |
| 28 | | | |
| 226 | | | |
| 59 | | | |
| 716 | | | |
| | | 3 | |
| 2240 | | | |
| 2240 | | | |
| 6420 | | | $\frac{1}{3}$ Ans |

$\frac{6420}{19200} = \frac{1}{3}$ Ans

Addition of Proper Fractions

III Case 1. III

1. Add $\frac{1}{12} \frac{5}{12} \frac{7}{12} \frac{9}{12}$ and $\frac{11}{12}$ together.

numerators.

$$\begin{array}{r} 1 \\ 5 \\ 7 \\ 9 \\ 11 \\ \hline 12 \overline{) 33} \end{array} \begin{array}{l} 2 \frac{3}{4} \text{ Ans} \\ 24 \\ \hline 9 - 3 \\ 12 - 4 \end{array}$$

2. Add $\frac{4}{25} \frac{8}{25} \frac{13}{25} \frac{16}{25}$ and $\frac{19}{25}$ together.

$$\begin{array}{r} 4 \\ 8 \\ 13 \\ 16 \\ 19 \\ \hline 25 \overline{) 60} \end{array} \begin{array}{l} 2 \frac{2}{5} \text{ Ans} \\ 50 \\ \hline 10 - 2 \\ 25 - 5 \end{array}$$

3. Add $\frac{15}{60} \frac{25}{60} \frac{45}{60}$ and $\frac{55}{60}$ together.

$$\begin{array}{r} 15 \\ 25 \\ 45 \\ 55 \\ \hline 60 \overline{) 140} \end{array} \begin{array}{l} 2 \frac{1}{3} \text{ Ans} \\ 120 \\ \hline 20 - 1 \\ 60 - 3 \end{array}$$

III Case 2. III

1. Add $\frac{1}{4} \frac{3}{8} \frac{5}{8} \frac{9}{12}$ together.

$$\begin{array}{r} 2 \overline{) 24812} \\ 2 \overline{) 1246} \\ \hline 1123 \end{array}$$

$$\begin{array}{r} 2 \\ 6 \\ 2 \\ 12 \\ \hline 2 \end{array}$$

$$\begin{array}{r} 2 \overline{) 24} \\ \hline 12 \times 1 = 12 \end{array}$$

$$4 \quad 6 \times 1 = 18$$

$$8 \quad 3 \times 1 = 15$$

$$12 \quad 2 \times 1 = 18$$

$$\begin{array}{r} 24 \overline{) 63} \end{array} \begin{array}{l} 2 \frac{15}{24} \text{ Ans} \\ 48 \\ \hline 15 \\ 24 \end{array}$$

2. Add $\frac{1}{2} \frac{1}{4} \frac{1}{5} \frac{1}{8}$ together.

$$\begin{array}{r} 2 \overline{) 2458} \\ 2 \overline{) 1254} \\ \hline 1152 \end{array}$$

$$\begin{array}{r} 5 \\ 10 \\ 2 \\ 20 \\ 2 \\ \hline 2 \end{array}$$

$$\begin{array}{r} 2 \overline{) 40} \\ \hline 20 \times 1 = 20 \end{array}$$

$$4 \quad 10 \times 1 = 10$$

$$5 \quad 8 \times 1 = 8$$

$$8 \quad 5 \times 1 = 5$$

$$\begin{array}{r} 40 \overline{) 43} \end{array} \begin{array}{l} 1 \frac{3}{40} \text{ Ans} \\ 40 \\ \hline 3 \\ 40 \end{array}$$

K

Addition of Vulgar fractions

3. Add $\frac{4}{5} \frac{5}{6} \frac{6}{7} \frac{8}{15}$ together.

$$\begin{array}{r} 5) 567815 \\ 2) 16783 \\ 3) 13748 \\ \hline 117411 \end{array}$$

$$\begin{array}{r} 117411 \\ 28 \\ 3 \\ 84 \\ 2 \\ \hline 1685 \end{array}$$

$$\begin{array}{l} 5) 840 \\ 168 \times 5 = 840 \\ 6140 \times 5 = 700 \\ 7120 \times 6 = 720 \\ 8105 \times 3 = 315 \\ 1556 \times 8 = 12448 \end{array}$$

$$\begin{array}{r} 840) 2855 (367 \text{ Ans} \\ 2520 \\ \hline 335 = 67 \\ 5) 840 = 168 \end{array}$$

Case 3. SSS

1. Add $13\frac{1}{5} 9\frac{4}{15} 3\frac{7}{15}$ together.

$$\begin{array}{r} 13\frac{1}{5} \\ 9\frac{4}{15} \\ 3\frac{7}{15} \\ \hline 25\frac{12}{15} = 25\frac{4}{5} \text{ Ans} \end{array}$$

2. Add $5\frac{2}{3} 6\frac{7}{8} 4\frac{1}{2}$ together.

$$\begin{array}{l} 5\frac{2}{3} = 5\frac{16}{24} \text{ Com. denom} \\ 6\frac{7}{8} = 6\frac{21}{24} \\ 4\frac{1}{2} = 4\frac{12}{24} \end{array}$$

$$\begin{array}{r} 119 - 2\frac{1}{24} \\ 24 \\ 152 \\ 2\frac{1}{24} \\ \hline 17\frac{1}{24} \text{ Ans} \end{array}$$

3. Add $1\frac{2}{3} \frac{4}{5} \frac{1}{5} 9\frac{2}{20}$ together.

$$\frac{4}{5} \text{ of } \frac{1}{5} = \frac{4}{25}$$

$$\begin{array}{r} 5) 21520 \\ 1311 \\ 3 \\ 12 \\ 3 \end{array}$$

$$\begin{array}{l} 5) 60 \\ 12 \times 3 = 136 \\ 15 \times 11 = 166 \\ 20 \times 3 = 99 \\ \hline 11\frac{16}{16} \text{ Ans} \end{array}$$

4. Add $1\frac{1}{2} 6\frac{7}{8} 3\frac{1}{2} 7\frac{1}{2}$ together.

$$\frac{1}{2} \frac{1}{2} 2\frac{1}{2} \frac{1}{2} \frac{1}{2}$$

$$\begin{array}{r} 4711 \\ 2) 16832 \\ \hline 51131 \end{array}$$

$$\begin{array}{l} 10) 120 \\ 12 \times 9 = 1108 \\ 8 \times 15 \times 7 = 6105 \\ 3 \times 4 \times 1 = 110 \\ 2 \times 60 \times 1 = 760 \\ \hline 16\frac{73}{120} \text{ Ans} \end{array}$$

$$16\frac{73}{120} \text{ Ans}$$

$$\begin{array}{r} 120) 3132 \\ 240 \\ \hline 73 \end{array}$$

Addition of Vulgar Fractions

Case n. III

1. Add $\frac{7}{9}$ of a £. and $\frac{3}{10}$ of a shilling.

$$\begin{array}{r} 20 \\ 9 \overline{) 140} \\ \underline{15} \end{array} \quad \begin{array}{r} 6 \frac{6}{9} = \frac{2}{3} \\ 10 \overline{) 86} \\ \underline{36} = 3 \\ \underline{10} = 5 \end{array}$$

$$\frac{2}{3} \quad \frac{3}{5}$$

$$\begin{array}{r} 3 \overline{) 15} \\ \underline{5 \times 2 = 10} \\ 5 \end{array} \quad \begin{array}{r} 3 \times 3 = 00 \\ \underline{3 \times 15} \\ 15 \end{array} \quad \begin{array}{r} 10 \\ 15 \\ 9 \end{array}$$

Ans. 15 10 $\frac{4}{15}$

2. Add $\frac{1}{2}$ of a yard to $\frac{2}{3}$ of a foot.

Ans. 2 feet 2 inches

$$\begin{array}{r} 3 \\ 2 \overline{) 3} \\ \underline{1} \end{array} \quad \begin{array}{r} 12 \\ 3 \overline{) 24} \\ \underline{8} \end{array}$$

Ans. 2 2

3. Add $\frac{1}{3}$ of a day to $\frac{1}{2}$ of an hour.

Ans. 8 hours 30 min.

$$\begin{array}{r} 24 \\ 3 \overline{) 24} \\ \underline{8} \end{array} \quad \begin{array}{r} 60 \\ 2 \overline{) 60} \\ \underline{30} \end{array}$$

$$\begin{array}{r} \frac{1}{3} \text{ of a day} = 8 \dots 00 \\ \frac{1}{2} \text{ of an hour} = \dots 30 \\ \hline 8 \dots 30 \text{ Ans} \end{array}$$

4. Add $\frac{1}{3}$ of week. $\frac{1}{2}$ of a day.

Ans. 2 days 14 hours 30 min.

$$\begin{array}{r} 7 \\ 3 \overline{) 7} \\ \underline{2 \dots 8} \dots 00 \\ 0 \dots 6 \dots 30 \\ \hline 2 \dots 14 \dots 30 \text{ Ans} \end{array} \quad \begin{array}{r} 24 \\ 12 \overline{) 24} \\ \underline{6} \end{array} \quad \begin{array}{r} 260 \\ 30 \overline{) 260} \\ \underline{30} \end{array}$$

5. Add $\frac{1}{3}$ of a mile. $\frac{2}{3}$ of a yard. and $\frac{3}{4}$ of a foot together. Ans. 1540 yards 2 feet 9 inches.

$$\begin{array}{r} 1460 \\ 8 \overline{) 12320} \\ \underline{1540} \dots 2 \dots 9 \text{ Ans} \end{array} \quad \begin{array}{r} 3 \\ 3 \overline{) 6} \\ \underline{2} \end{array} \quad \begin{array}{r} 12 \\ 12 \overline{) 36} \\ \underline{9} \end{array}$$

Section 3. III

1

2

3

Subtraction of Vulgar fractions

from $\frac{7}{8}$
Take $\frac{3}{8}$
Rem. $\frac{4}{8} = \frac{1}{2}$ Ans.

from $\frac{6}{7}$
Take $\frac{2}{7}$
Rem. $\frac{4}{7}$ Ans.

from $\frac{2}{3} = \frac{8}{12}$
Take $\frac{3}{4} = \frac{9}{12}$
 $\frac{5}{12}$ Ans.

from $\frac{11}{12}$
Take $\frac{3}{12}$
Rem. $\frac{8}{12}$

from $\frac{15}{16}$
Take $\frac{11}{16}$
Rem. $\frac{4}{16}$

$4 \overline{) \frac{11}{12} \frac{3}{12}}$

$4 \overline{) \frac{15}{16} \frac{11}{16}}$

$12 \overline{) \frac{11}{12}}$
 $1 \times 11 = \frac{11}{12}$
 $4 \times 3 \times 3 = \frac{9}{12}$

$16 \overline{) \frac{15}{16} \frac{11}{16}}$
 $3 \times 15 = \frac{45}{16}$
 $12 \times 11 = \frac{132}{16}$

$\frac{2}{12} = \frac{1}{6}$ Ans

$\frac{1}{16}$ Ans

from $\frac{5}{6}$
Take $\frac{4}{6}$
Rem. $\frac{1}{6}$

from $12 \frac{5}{12}$
Take $6 \frac{1}{2}$
Rem. $5 \frac{11}{12}$

$6 \overline{) \frac{5}{6} \frac{4}{6}}$
 $5 \times 5 = \frac{25}{6}$
 $5 \times 6 \times 4 = \frac{24}{6}$

$\frac{1}{30}$ Ans

$2 \overline{) \frac{5}{12} \frac{1}{2}}$

from $\frac{209}{216}$
Take $\frac{7}{144}$
Rem. $\frac{397}{432}$

$12 \overline{) \frac{5}{12}}$
 $1 \times 5 = 12 \frac{5}{12}$
 $6 \times 1 = 6 \frac{6}{12}$

$5 \frac{11}{12}$ Ans

$2 \overline{) \frac{209}{216} \frac{7}{144}}$
 $9 \overline{) \frac{108}{72}}$
 $4 \overline{) \frac{12}{8}}$

from $13 \frac{1}{4}$
Take $8 \frac{14}{24}$
Rem. $4 \frac{16}{24}$

$9 \overline{) \frac{1}{9} \frac{14}{24}}$
 $3 \times 1 = 13 \frac{8}{24}$
 $24 \times 14 = 8 \frac{14}{24}$

$4 \frac{16}{24}$ Ans

$216 \overline{) \frac{397}{432}}$
 $2 \times 209 = \frac{418}{432}$
 $144 \times 7 = \frac{21}{432}$
 $\frac{397}{432}$ Ans

Subtraction of Vulgar Fractions

From $10\frac{3}{10}$
Take $1\frac{7}{12}$
Rem $8\frac{13}{60}$

$$\begin{array}{r} 2\cancel{10}\frac{3}{5} \quad \frac{17}{12} \\ \underline{5} \quad \underline{6} \\ 6 \\ 30 \\ \underline{2} \\ 10\cancel{60} \\ 5 \times 3 = 10\frac{18}{60} \\ 12 \quad 5 \times 7 = 1\frac{35}{60} \end{array}$$

$8\frac{13}{60}$ Ans

From $\frac{7}{10}$ of a £. = $15\frac{6}{10}$
Take $\frac{3}{10}$ of a £. = $0\frac{3}{10}$

$$\begin{array}{r} 15\frac{3}{10} \\ \text{Rem } \frac{7}{10} \\ 20 \\ \underline{3} \\ 9\cancel{140} \text{ (3)} \\ 15:6\frac{6}{9} = \frac{2}{3} \end{array}$$

$15:6\frac{10}{15}$

$0\frac{3}{15}$

$15:3\frac{1}{15}$ Ans

From $19\frac{5}{11}$
Take $0\frac{7}{15}$
Rem. $18\frac{163}{165}$

$$\begin{array}{r} 19\frac{5}{11} \\ \underline{0\frac{7}{15}} \\ 18\frac{163}{165} \\ 11\cancel{165} \\ 15 \times 5 = 19\frac{75}{165} \\ 15 \quad 11 \times 7 = 0\frac{77}{165} \end{array}$$

$18\frac{163}{165}$ Ans

From 7 weeks
Take $9\frac{7}{10}$ days

Rem. 5 w. 4 d. 7 h. 12 mi

$$\begin{array}{r} 2\frac{1}{4} \\ 10\cancel{168} \\ 16:48 \end{array}$$

| w | d | h | mi |
|---|---|----|----|
| 7 | 0 | 0 | 0 |
| 0 | 9 | 16 | 48 |

| | | | |
|---|---|---|----|
| 5 | 4 | 7 | 12 |
|---|---|---|----|

$$\begin{array}{r} 2\frac{1}{4} \\ 10\cancel{168} \\ 16,80 \\ \text{min } 48,0 \end{array}$$

$7\frac{1}{2}$
1. 2 days

| W | d | h | mi |
|---|---|----|----|
| 7 | 0 | 00 | 00 |
| 1 | 2 | 16 | 48 |
| 5 | 4 | 7 | 12 |

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Multiplication of Vulgar fraction

Section 11

6. Multiply $\frac{2}{3}$ of $\frac{1}{4}$ by $\frac{1}{2}$. Ans $\frac{1}{12}$

1. Multiply $\frac{2}{3}$ by $\frac{1}{4}$.

$$\frac{2 \times 1 = 2}{3 \times 4 = 12} = \frac{1}{6} \text{ Ans}$$

$$\begin{array}{r} 9 \\ 3 \\ \hline 1 \overline{) 27} \\ 6 \\ \hline 27 \times 4 = 108 \end{array}$$

2. Multiply $\frac{1}{2}$ by $\frac{1}{4}$.

$$\frac{1 \times 1 = 1}{2 \times 4 = 8} = \frac{1}{8} \text{ Ans.}$$

$$\begin{array}{r} 11 \times 8 = 88 \\ 189 \\ 160 \\ \hline 29 \\ 32 \end{array}$$

3. Multiply $\frac{3}{4}$ by $\frac{4}{5}$. Ans $\frac{3}{5}$

$$\frac{3 \times 4 = 12 = 3}{4 \times 5 = 20 = 5} \text{ Ans}$$

7. Multiply $\frac{1}{2}$ of $\frac{3}{4}$ by $\frac{1}{2}$. Ans $\frac{3}{16}$

$$\frac{1 \times 3 = 3}{2 \times 4 = 8} = \frac{3}{8}$$

$$\begin{array}{r} 488 \\ 213 \times 88 = 20169 \\ 5 \times 6 = 30 \\ 20169 \\ 180 \\ \hline 216 \\ 210 \\ \hline 69 \\ 60 \\ \hline 3 \overline{) 9} = \frac{3}{10} \text{ Ans} \end{array}$$

4. Multiply $\frac{2}{3}$ of $\frac{3}{4}$ by $\frac{1}{2}$. Ans $\frac{1}{4}$

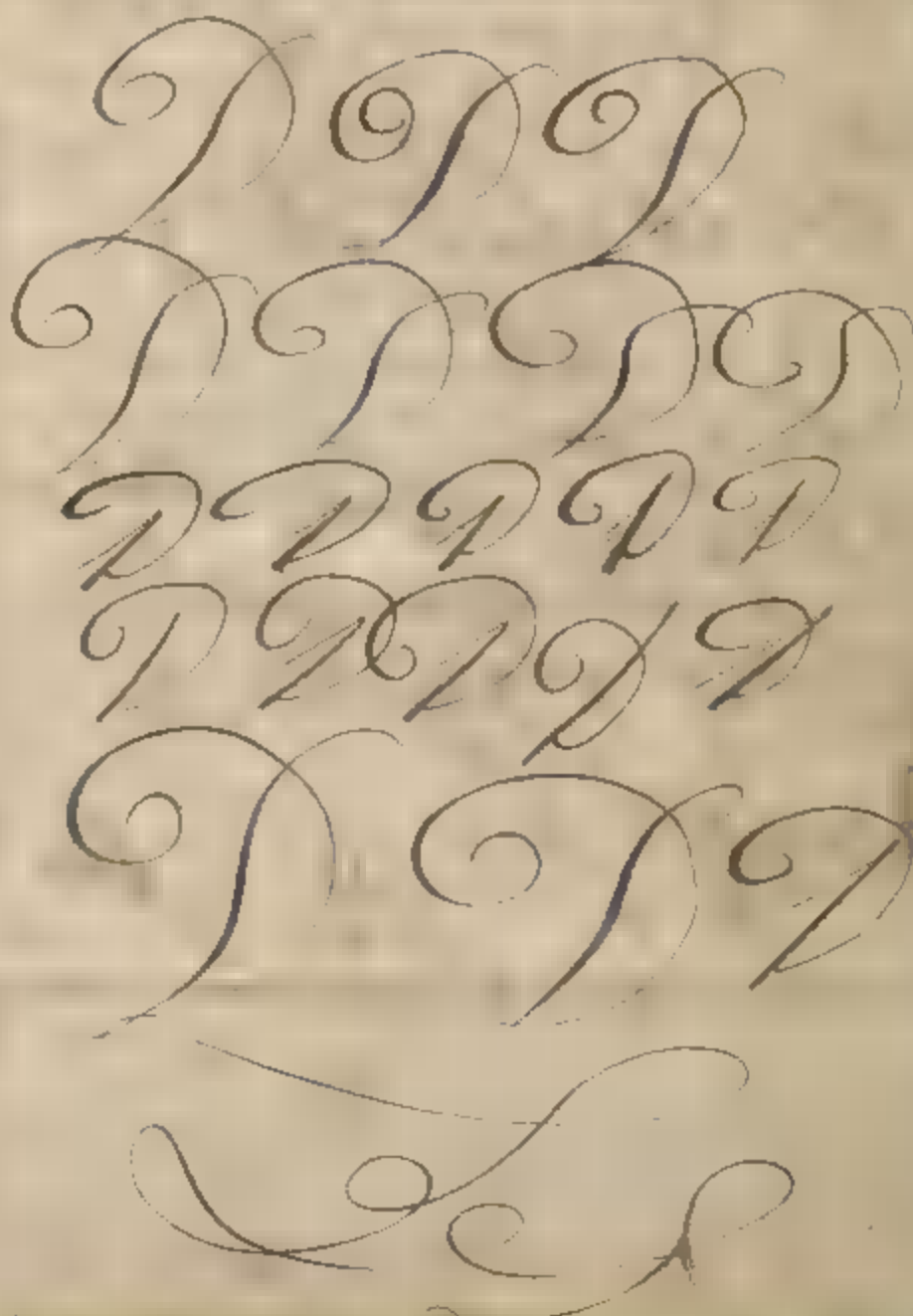
$$\frac{2}{3} \text{ of } \frac{3}{4} = \frac{2 \times 3}{3 \times 4} = \frac{2}{4} = \frac{1}{2}$$

$$\frac{1 \times 1 = 1}{2 \times 4 = 8} = \frac{1}{8} \text{ Ans}$$

5. Multiply $\frac{1}{2}$ by $\frac{1}{4}$. Ans $\frac{1}{8}$

$$\frac{1 \times 1 = 1}{2 \times 4 = 8} = \frac{1}{8} \text{ Ans}$$

$$\frac{1 \times 1 = 1}{2 \times 4 = 8} = \frac{1}{8} \text{ Ans}$$



Division of Vulgar Fractions James McCormick

1. Divide $\frac{3}{8}$ by $\frac{2}{3}$.

$$\frac{3 \times 3}{8 \times 2} = \frac{9}{16} \text{ Ans}$$

2. Divide $1\frac{1}{2}$ by $1\frac{2}{3}$.

$$\frac{1\frac{1}{2}}{\frac{2}{3}} = \frac{3}{2} \times \frac{3}{2} = \frac{9}{4} = 2\frac{1}{4} \text{ Ans}$$

3. Divide $\frac{17}{21}$ by $\frac{3}{4}$.

3. Divide $\frac{3}{8}$ by $\frac{4}{9}$. Ans. $\frac{21}{48}$

$$\frac{3 \times 6}{8 \times 4} = \frac{21}{48} \text{ Ans}$$

4. Divide $1\frac{1}{2}$ by $1\frac{8}{10}$. Ans. $1\frac{22}{63}$

$$\frac{1\frac{1}{2}}{1\frac{8}{10}} = \frac{3}{2} \times \frac{5}{8} = \frac{15}{16} = 1\frac{22}{63} \text{ Ans}$$

5. Divide $\frac{7}{8}$ by 11 . Ans. $\frac{5}{16}$

$$\frac{\frac{7}{8}}{11} = \frac{7}{8} \times \frac{1}{11} = \frac{7}{88} = \frac{5}{16} \text{ Ans}$$

6. Divide $\frac{7}{8}$ by 11 . Ans. $\frac{7}{32}$

$$\frac{\frac{7}{8}}{11} = \frac{7}{8} \times \frac{1}{11} = \frac{7}{88} = \frac{7}{32} \text{ Ans}$$

7. Divide $9\frac{1}{2}$ by $\frac{1}{2}$ of 4. Ans. $2\frac{13}{21}$

$$\frac{9\frac{1}{2}}{\frac{1}{2} \times 4} = \frac{19}{2} \times \frac{1}{2} = \frac{19}{4} = 4\frac{3}{4}$$

$$\frac{21}{3\frac{1}{2}} = \frac{21}{\frac{7}{2}} = 21 \times \frac{2}{7} = 6$$

$$6 \times 7 = 42 \quad 110 \div 42 = 2\frac{13}{21}$$

$$\frac{26}{42} = \frac{13}{21}$$

8. Divide $5205\frac{1}{5}$ by $\frac{4}{5}$ of 91. Ans. $71\frac{1}{2}$

$$\frac{91}{\frac{4}{5}} = 91 \times \frac{5}{4} = 113\frac{1}{4}$$

$$\frac{5205\frac{1}{5}}{113\frac{1}{4}} = \frac{26026 \times 5}{5 \times 364} = \frac{26026}{364} = 71\frac{1}{2}$$

$$130130$$

$$1820 \overline{) 180180} = 99 \text{ Ans}$$

$$12440$$

$$2730$$

$$1820$$

$$910 \overline{) 910} = 1$$

$$1820 \overline{) 1820} = 2$$

The Rules Three In Figure Fractions

Section 6. III

1. If $\frac{1}{4}$ of a yard of cloth cost $\frac{2}{3}$ of a dollar, what will $\frac{7}{8}$ of a yard come to: *Ans*

$$\frac{1}{4} : \frac{2}{3} :: \frac{7}{8} : \frac{56}{24} 2\frac{2}{3} \text{ Ans}$$

2. If $\frac{2}{3}$ of a ton of iron cost 16 $\frac{1}{2}$ dollars, what will $\frac{5}{6}$ of a ton come to: *Ans* 211 dollars 28 $\frac{1}{2}$ cts.

$$\frac{2}{3} : 16\frac{1}{2} :: \frac{5}{6} : 211\frac{28}{2}$$

$$\begin{array}{r} 3 \times 49386 \\ 2 \times 3 \times 7 \\ 3 \\ 6 \\ 7 \\ 42 \end{array}$$

$$42 \overline{) 8974} (21628\frac{12}{21} \text{ Ans}$$

$$\begin{array}{r} 44 \\ 42 \\ 54 \\ 42 \\ 120 \\ 84 \\ 360 \\ 396 \\ 2 \overline{) 24} (12 \\ 42 \end{array}$$

3. A person having $\frac{3}{4}$ of a coal mine, sells $\frac{3}{4}$ of his share for 141 dollars, what is the value of the whole mine at the same rate:

Ans 380 dollars.

$$\frac{3}{4} \text{ of } \frac{3}{4} = \frac{9}{16} : \frac{141}{1} :: \frac{1}{1}$$

$$\begin{array}{r} 141 \\ 20 \\ 9 \overline{) 3420} \end{array} \text{ dollars Ans}$$

4. At $\frac{5}{6}$ of a dollars per yard what will 42 yards come to: *Ans* 35 dollars.

$$\frac{5}{6} : \frac{42}{1} :: \frac{1}{1}$$

$$6 \overline{) 210} \text{ Ans}$$

5. A gentleman owning $\frac{2}{3}$ of a vessel, sells $\frac{2}{3}$ of his share for 312 dollars, what is the whole vessel worth: *Ans* 1140 dollars.

$$\frac{2}{3} : \frac{312}{15} :: \frac{1}{1}$$

$$\begin{array}{r} 312 \\ 15 \\ 1560 \\ 312 \\ 4 \overline{) 11680} \end{array} \text{ Ans}$$

6. If $\frac{1}{3}$ bushels of apples cost 49 $\frac{1}{2}$ cents, what will $\frac{3}{4}$ bushels cost at the same rate: *Ans* 202 $\frac{3}{10}$ cents.

$$\begin{array}{r} \frac{1}{3} \\ \frac{1}{4} \end{array} \cdot \frac{49\frac{1}{2}}{3} \cdot \frac{3}{4} = \frac{238}{15} \cdot \frac{3}{4} = \frac{238}{20} = 11\frac{14}{10} = 11\frac{7}{5}$$

$$60 \overline{) 1258} \text{ Ans}$$

in the place 3 $\frac{1}{2}$

4. If $\frac{1}{5}$ of a ship be worth 175 dollars 35 cents, what part of her may be purchased for 601 dollars 20 cents: Ans. $\frac{3}{4}$.

$$\frac{175.35}{1} : \frac{1}{5} :: 601.20$$

~~175.35~~

$$20040 \overline{) 60120} = 3 \text{ Ans}$$

$$\begin{array}{r} 60120 \overline{) 140280} \\ 120240 \\ \hline 20040 \end{array}$$

Inverse Proportion.

Section 7.

1. How much shall one $\frac{1}{2}$ yards it take 16 men to do the same wide, will line $\frac{1}{2}$ yards of cloth worth: Ans. $28\frac{1}{2}$ days.

$$\frac{1\frac{1}{2} = \frac{3}{2}}{4\frac{1}{2} = \frac{9}{2}} \text{ then } \frac{3}{2} : \frac{9}{2} :: \frac{2}{1}$$

$$\text{Or inverted } \frac{3}{2} : \frac{9}{2} :: \frac{4}{3} = \frac{108}{12} = 9 \text{ Ans}$$

3. If 12 men can finish a piece of work in $34\frac{3}{4}$ days; how long will

$$\begin{array}{r} 34\frac{3}{4} \\ 12 \cdot \frac{188}{5} \cdot \frac{16}{1} \\ \hline 16 \\ 30 \\ 50 \\ 80 \end{array} \quad \begin{array}{r} 188 \\ 12 \\ \hline 2256 \end{array} \quad \begin{array}{r} 28\frac{1}{2} \text{ Ans} \\ 160 \\ \hline 656 \\ 640 \\ \hline 16 \\ 16 \overline{) 80} = 5 \end{array}$$

2. If 6 $\frac{1}{2}$ hundred weight be carried $22\frac{2}{3}$ miles for 25 $\frac{2}{3}$ dollars. how far may 1 hundred weight be carried for the same money:

$$\begin{array}{ccc} \text{cwt} & \text{M} & \text{Ans.} \\ 6\frac{1}{2} : 22\frac{2}{3} :: 1 & & 145\frac{1}{4} \text{ miles.} \end{array}$$

$$\frac{13}{2} : \frac{581}{26} :: 1$$

$$\begin{array}{r} 581 \\ 13 \\ \hline 1413 \\ 581 \\ \hline 52 \overline{) 7553} 145\frac{1}{4} \text{ Ans} \\ 52 \\ \hline 235 \\ 208 \\ \hline 247 \\ 260 \\ \hline 13 \overline{) 13} = 1 \\ 13 \overline{) 52} = 4 \end{array}$$

4. A lends to B 100 $\frac{2}{3}$ dollars for 6 $\frac{2}{3}$ months; what sum should B lend to A for 35 years, to requite his kindness. Ans. 111 $\frac{122}{207}$ dol

$$\begin{array}{ccc} \text{M} & \text{D} & \text{years} \\ 6\frac{2}{3} : 100\frac{2}{3} : 35 \\ \hline 20 & 302 & 146 \text{ Months} \\ 3 & 3 & 1 \end{array} \quad \begin{array}{r} 146 \\ 138 \\ \hline 8 \\ 111 \overline{) 6040} 111\frac{122}{207} \\ 414 \\ \hline 1900 \\ 1656 \\ \hline 2 \overline{) 244} 122 \\ 2 \overline{) 111} 207 \end{array}$$

5. How many feet long must a
 cord be, that is $\frac{3}{4}$ of a foot wide,
 to equal one that is $20\frac{1}{2}$ feet long,
 and $\frac{3}{4}$ of a foot wide:

Ans. $14\frac{1}{4}$ feet long.

$$\begin{array}{r} 20\frac{1}{2} \\ \frac{3}{4} : \frac{41}{2} \dots \frac{11}{8} \\ \hline 2 \\ \hline 8 \\ \hline 4 \\ \hline 56 \end{array}$$

$$\begin{array}{r} 328 \\ \hline 984 \\ \hline 56 \\ \hline 424 \\ \hline 392 \\ \hline 32 \\ \hline 56 \end{array}$$

$14\frac{1}{4}$ Ans

6. In exchanging $20\frac{1}{2}$ yards
 of cloth of $\frac{1}{4}$ yard wide for
 some of the same quality of
 $\frac{3}{4}$ yards wide, what quantity
 of the latter makes an equal
 barter: Ans. $31\frac{1}{6}$ yards.

$$\begin{array}{r} 1\frac{1}{4} \\ \hline 5 \\ \hline 11 \\ \hline 2 \\ \hline 8 \\ \hline 3 \\ \hline 21 \end{array}$$

$$\begin{array}{r} 20\frac{1}{2} \\ \hline 41 \dots 3 \\ \hline 2 \dots 11 \\ \hline 164 \\ \hline 5 \\ \hline 820 \\ \hline 42 \\ \hline 100 \\ \hline 96 \\ \hline 4 \\ \hline 11 \end{array}$$

$31\frac{1}{6}$ Ans.

Evolution or The raising of Powers

Section 1.

1. What is the 3d power of 15:

$$15 \times 15 \times 15 = 3375 \text{ Ans.}$$

$$\begin{array}{r} 15 \\ 15 \\ \hline 75 \\ 15 \\ \hline 225 \\ 15 \\ \hline 1125 \\ 225 \\ \hline 3375 \text{ Ans} \end{array}$$

2. What is the 4th power of 35:

$$\text{Ans. } 1500625.$$

$$\begin{array}{r} 35 \\ 35 \\ \hline 1225 \\ 35 \\ \hline 6125 \\ 35 \\ \hline 42875 \\ 35 \\ \hline 214375 \\ 35 \\ \hline 128625 \\ 35 \\ \hline 1500625 \text{ Ans.} \end{array}$$

3. What is the 3d power of 1.03:

$$\text{Ans. } 1.092727.$$

$$\begin{array}{r} 1.03 \\ 1.03 \\ \hline 3.09 \\ 1.030 \\ \hline 1.0609 \\ 1.03 \\ \hline 3.1827 \\ 1.06090 \\ \hline 1.092727 \text{ Ans} \end{array}$$

4. What is the 5th power of

$$.029: \text{Ans. } .000000704281.$$

$$\begin{array}{r} .029 \\ .029 \\ \hline 261 \\ 58 \\ \hline .000841 \\ .029 \\ \hline 7569 \\ 1682 \\ \hline .000024389 \\ .029 \\ \hline 219501 \\ 48778 \\ \hline .000000707281 \text{ Ans} \end{array}$$

5. What is the 4th power of $\frac{3}{4}$:

$$\text{Ans. } \frac{81}{256}$$

$$3 \times 3 \times 3 \times 3 = 81$$

$$4 \times 4 \times 4 \times 4 = 256$$

Ans

The Square Root

Section 3.

1. What is the square root of 531441

$$\begin{array}{r} 531441 \quad (729 \text{ Ans.}) \\ 49 \overline{) 531441} \\ \underline{414} \\ 1174 \\ 980 \\ \underline{980} \\ 1459 \\ 1458 \\ \underline{1458} \\ 1 \end{array}$$

proof: $729 \times 729 = 531441$

2. What is the square root of 106929: Ans. 327.

$$\begin{array}{r} 106929 / 327 \text{ Ans.} \\ 9 \overline{) 106929} \\ \underline{81} \\ 259 \\ 216 \\ \underline{216} \\ 429 \\ 423 \\ \underline{423} \\ 69 \\ 69 \\ \underline{69} \\ 0 \end{array}$$

3. What is the square root of 4482969: Ans. 2117.

$$\begin{array}{r} 4482969 / 2117 \text{ Ans.} \\ 41 \overline{) 4482969} \\ \underline{41} \\ 3729 \\ 3421 \\ \underline{3421} \\ 3089 \\ 3056 \\ \underline{3056} \\ 33 \end{array}$$

4. What is the square root of 43046421: Ans. 6561.

$$\begin{array}{r} 43046421 / 6561 \text{ Ans.} \\ 36 \overline{) 43046421} \\ \underline{72} \\ 1584 \\ 1296 \\ \underline{1296} \\ 28821 \\ 25920 \\ \underline{25920} \\ 2901 \\ 2592 \\ \underline{2592} \\ 309 \\ 309 \\ \underline{309} \\ 0 \end{array}$$

5. What is the square root of 884420489: Ans. 29739.

$$\begin{array}{r} 884420489 / 29739 \text{ Ans.} \\ 29 \overline{) 884420489} \\ \underline{518} \\ 3664 \\ 3366 \\ \underline{3366} \\ 3078 \\ 2767 \\ \underline{2767} \\ 3119 \\ 2973 \\ \underline{2973} \\ 146 \\ 146 \\ \underline{146} \\ 0 \end{array}$$

6. What is the square root of 22041204: Ans. 4694.

$$\begin{array}{r} 22041204 / 4694 \text{ Ans.} \\ 16 \overline{) 22041204} \\ \underline{32} \\ 884 \\ 838 \\ \underline{838} \\ 4624 \\ 4236 \\ \underline{4236} \\ 388 \\ 388 \\ \underline{388} \\ 0 \end{array}$$

7. What is the square root of 36372961: Ans. 6031.

$$\begin{array}{r} 36372961 / 6031 \text{ Ans.} \\ 36 \overline{) 36372961} \\ \underline{36} \\ 729 \\ 7254 \\ \underline{7254} \\ 4161 \\ 4023 \\ \underline{4023} \\ 1381 \\ 1381 \\ \underline{1381} \\ 0 \end{array}$$

2

The Square Root

8. What is the square root of 2268741: Ans. 1506.23+

$$\begin{array}{r}
 2268741 \quad (1506.23+ \text{Ans}) \\
 126 \\
 125 \\
 \hline
 3006 \overline{) 18741} \\
 15036 \\
 \hline
 30122 \overline{) 70500} \\
 60244 \\
 \hline
 30124 \overline{) 1025600} \\
 903729 \\
 \hline
 121871
 \end{array}$$

9. What is the square root of 7596796: Ans. 2756.228+

$$\begin{array}{r}
 7596796 \quad (2756.228+ \text{Ans}) \\
 11.4 \overline{) 359} \\
 329 \\
 \hline
 54.5 \overline{) 3067} \\
 2725 \\
 \hline
 556.6 \overline{) 34296} \\
 33036 \\
 \hline
 5512.2 \overline{) 126000} \\
 110244 \\
 \hline
 55124.2 \overline{) 1545600} \\
 1102484 \\
 \hline
 551244.8 \overline{) 47311600} \\
 44099584 \\
 \hline
 3212016
 \end{array}$$

10. What is the square root of 9712.718051: Ans. 98.553+

$$\begin{array}{r}
 9712.718051 \quad (98.553+ \text{Ans}) \\
 81 \\
 18.8 \overline{) 1612} \\
 1504 \\
 \hline
 196.5 \overline{) 10871} \\
 9825 \\
 \hline
 1940.5 \overline{) 104680} \\
 98525 \\
 \hline
 19710.3 \overline{) 615551} \\
 591309 \\
 \hline
 24242
 \end{array}$$

11. What is the square root of 3.1421812: Ans. 1.78106+

$$\begin{array}{r}
 3.14218120 \quad (1.78106+ \text{Ans}) \\
 2.7 \overline{) 217} \\
 189 \\
 \hline
 34.8 \overline{) 2821} \\
 2784 \\
 \hline
 356.1 \overline{) 3481} \\
 3561 \\
 \hline
 35620.6 \overline{) 2202000} \\
 2137836 \\
 \hline
 64164
 \end{array}$$

12. What is the square root of 4795.25431: Ans. 69.247+

$$\begin{array}{r}
 4795.254310 \quad (69.247+ \text{Ans}) \\
 36 \\
 12.9 \overline{) 1195} \\
 1161 \\
 \hline
 183.2 \overline{) 3425} \\
 2764 \\
 \hline
 1384.4 \overline{) 66173} \\
 55376 \\
 \hline
 13848.4 \overline{) 1079710} \\
 969299 \\
 \hline
 110411
 \end{array}$$

Square Root James M. Munnick

13. What is the square root of .0000886. Ans. .00944

$$\begin{array}{r} .0000886 \text{ (00944 Ans)} \\ 81 \overline{) 81} \\ 184 \overline{) 736} \\ \underline{436} \end{array}$$

3. What is the square root of

$$\begin{array}{r} 15625. \text{ Ans. } 125 \\ 46656. \text{ } 216 \end{array}$$

$$\begin{array}{r} 15625 (125 \\ 22 \overline{) 56} \\ \underline{44} \\ 245 \overline{) 1225} \\ \underline{1225} \end{array} \quad \frac{125}{216} \text{ Ans}$$

$$\begin{array}{r} 46656 (216 \\ 4 \overline{) 66} \\ \underline{41} \\ 426 \overline{) 2556} \\ \underline{2556} \end{array}$$

Examples

1. What is the square root of $\frac{2304}{5184}$. Ans. $\frac{2}{3}$

$$\begin{array}{r} 2304 \text{ (} \frac{4}{9} \text{)} \\ 576 \overline{) 5184} \end{array}$$

$$\begin{array}{r} 2 \overline{) 4} (2 \text{ Ans} \\ \underline{4} \\ 2 \overline{) 2} (3 \end{array}$$

Surds

4. What is the square root of $\frac{3571}{1176}$. Ans. 86602+

$$\begin{array}{r} 1176 \overline{) 3571} (3 \\ \underline{3528} \\ 2380 \quad 75 (86602+ \text{Ans} \\ \underline{2380} \quad 64 \\ 166 \overline{) 1100} \\ \underline{996} \\ 1726 \overline{) 10400} \\ \underline{10356} \\ 17320.2 \overline{) 1440000} \\ \underline{346404} \\ 93596 \end{array}$$

2. What is the square root of $\frac{2704}{4225}$. Ans. $\frac{4}{5}$

$$\begin{array}{r} 2704 \text{ (} \frac{16}{25} \text{)} \\ 169 \overline{) 4225} \end{array}$$

$$\begin{array}{r} 16 \overline{) 4} \text{ Ans} \\ \underline{25} \\ 25 \end{array}$$

Square Root James Monick

5. What is the square root of $\frac{448}{519}$. Ans. $93308+$

$$\begin{array}{r} 8706439526 \text{ (93309+ Ans)} \\ 81 \\ 183 \overline{) 606} \\ \underline{549} \\ 1863 \overline{) 5473} \\ \underline{5589} \\ 186609 \overline{) 1849526} \\ \underline{1679481} \\ \underline{1720445} \\ 140045 \end{array}$$

2. What is the square root of $34\frac{36}{49}$. Ans. $6\frac{1}{4}$

$$\begin{array}{r} 27\frac{9}{16} \\ 171 \\ 27 \\ 441 \\ 16(4 \\ 16 \end{array} \quad \begin{array}{r} 441(21 \\ 441 \\ 441 \\ 441 \\ 441 \end{array} \quad \begin{array}{r} 21(5\frac{1}{4} \text{ Ans} \\ 20 \\ 1 \\ 1 \end{array}$$

6. What is the square root of 387 . Ans. $72414+$

$$\begin{array}{r} 5243902439 \text{ (72414+ Ans)} \\ 49 \\ 142 \overline{) 343} \\ \underline{284} \\ 1444 \overline{) 5990} \\ \underline{5776} \\ 14481 \overline{) 21424} \\ \underline{14481} \\ 694339 \\ 144824 \overline{) 579296} \\ \underline{115043} \end{array}$$

3. What is the square root of $51\frac{21}{25}$. Ans. $7\frac{1}{5}$

$$\begin{array}{r} 51\frac{21}{25} \\ 2525 \\ 256 \\ 104 \\ 1296 \\ 25(5 \\ 25 \end{array} \quad \begin{array}{r} 1296(36 \\ 9 \\ 6,6)396 \\ 396 \end{array} \quad \begin{array}{r} 36(7\frac{1}{5} \text{ Ans} \\ 35 \\ 1 \\ 5 \end{array}$$

4. What is the square root of $9\frac{43}{49}$. Ans. $3\frac{1}{4}$

$$\begin{array}{r} 9\frac{43}{49} \\ 4949 \\ 84 \\ 40 \\ 484 \\ 49(7 \\ 49 \end{array} \quad \begin{array}{r} 484(22 \\ 44 \\ 44 \\ 44 \end{array} \quad \begin{array}{r} 22(3\frac{1}{4} \text{ Ans} \\ 21 \\ 1 \\ 4 \end{array}$$

Examples

1. What is the square root of 3736 . Ans. 61

$$\begin{array}{r} 3736 \\ 4949 \\ 339 \\ 151 \\ 1849 \\ 49(7 \\ 49 \end{array}$$

$$\begin{array}{r} 1849(43 \\ 16 \\ 83)249 \\ 249 \end{array} \quad \begin{array}{r} 43(6\frac{1}{4} \text{ Ans} \\ 42 \\ 1 \\ 4 \end{array}$$

Squad Capt James McMuck

SSS *Surd.* SSS

5 What is the square root of

$\frac{79}{11}$ Ans. 2. 7961 +

$\frac{79}{111}$

$11 \overline{)86}$

7.8181818181818181 Ann.

$4 \overline{)381}$

329

$54.9 \overline{)5281}$

4941

$5586 \overline{)34081}$

33516

$55921 \overline{)56581}$

55921

760


7. What is the square root of

$85\frac{14}{15}$: Ans. 9.27+

$$\begin{array}{r} 85 \frac{14}{15} \\ 15 \overline{) 1515} \\ \underline{15} \\ 0 \\ 0 \\ 0 \end{array}$$

6. What is the square root of

25. Ann 2.9519+

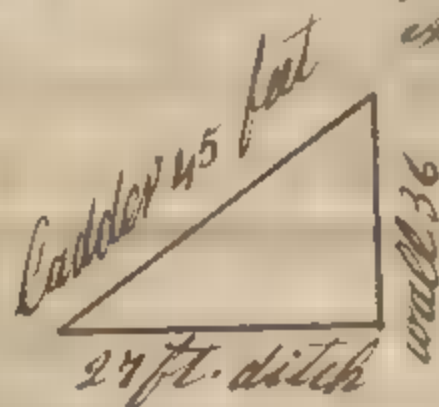
$$\begin{array}{r} 85 \\ \underline{4} \\ 4) 61 \\ \underline{8} \text{ } 71428571 (29519 + \text{Ans} \\ 4 \\ 4,9) 4171 \\ \underline{441} \\ 58,5) 3042 \\ \underline{2925} \\ 590,1) 11785 \\ \underline{5901} \\ 5902,9) 588471 \\ \underline{531261} \\ 57210 \end{array}$$


Squire Ant James Wormick

III Example. III

1. The wall of a fort rajs is 36 feet high, and the ditch before it is 27 feet wide. it is required to find the length of a ladder that will reach to the top of the wall from the opposite side of the ditch:

Ans. 45 feet.



$$\begin{array}{r}
 36 \\
 36 \\
 \hline
 216 \\
 108 \\
 \hline
 1296 \\
 729 \\
 \hline
 2025 \text{ (45 Ans.)} \\
 16 \\
 \hline
 8.5 \overline{) 425} \\
 425 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 27 \\
 27 \\
 \hline
 189 \\
 54 \\
 \hline
 729
 \end{array}$$

2. The top of a castle from the ground is 45 yards high, and is surrounded with a ditch 60 yards broad. what length must a cable be to reach from the outside of the ditch to the top of the castle: Ans. 75 yards.

$$\begin{array}{r}
 45 \\
 45 \\
 \hline
 225 \\
 180 \\
 \hline
 2025 \\
 3600 \\
 \hline
 5625 \text{ (75 Ans.)} \\
 49 \\
 \hline
 115 \overline{) 725} \\
 725 \\
 \hline
 \end{array}$$

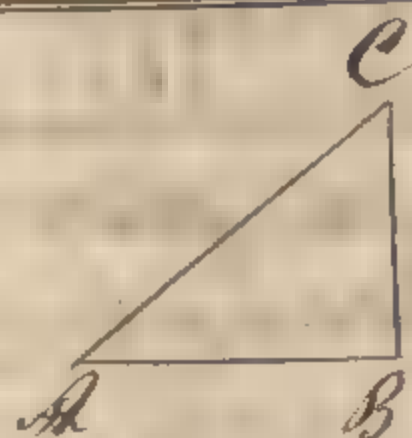
$$\begin{array}{r}
 60 \\
 60 \\
 \hline
 3600
 \end{array}$$

3. In a right angled triangle.

At B C. the hypotheruse line

AC is 45 feet, the base or B 27 feet; required the length of the perpendicular line BC: Ans. 36 feet.

$$\begin{array}{r}
 45 \\
 45 \\
 \hline
 225 \\
 180 \\
 \hline
 2025 \\
 729 \\
 \hline
 1296 \text{ (36 Ans.)} \\
 9 \\
 \hline
 6.6 \overline{) 396} \\
 396 \\
 \hline
 \end{array}$$



4. In the right angled triangle

At B C. the line AC is 75 feet. BC 45 feet: required the length of the line or B; Ans. 60 feet

$$\begin{array}{r}
 75 \\
 75 \\
 \hline
 345 \\
 525 \\
 \hline
 5625 \\
 2025 \\
 \hline
 3600 \text{ (60 Ans.)} \\
 36 \\
 \hline
 12 \overline{) 0000}
 \end{array}$$

(Signature)

Square Root



Examples

1. If the content of a given circle be 160. what is the side of the square equal. Ans. 12.64911+

$$\begin{array}{r}
 160(12.64911+ \text{Ans.} \\
 22 \overline{) 60} \\
 \underline{44} \\
 1600 \\
 246 \overline{) 1600} \\
 \underline{1496} \\
 10400 \\
 2524 \overline{) 10400} \\
 \underline{10096} \\
 30400 \\
 2528.9 \overline{) 30400} \\
 \underline{227601} \\
 763900 \\
 25298.1 \overline{) 763900} \\
 \underline{252981} \\
 10091900 \\
 252982.1 \overline{) 10091900} \\
 \underline{2529821} \\
 162079
 \end{array}$$

2. If the area of a circle be 2025, what is the side of the square equal.

Ans. 45
 $2025(45 \text{ Ans.}$
 $8.5 \overline{) 425}$
 $\underline{425}$

3. If the area of a circle be 750. what is the side of the square equal:

Ans. 27.38612+
 $750(27.38612+ \text{Ans}$
 $44 \overline{) 350}$
 $\underline{329}$
 $543 \overline{) 1629}$
 $\underline{1629}$
 $5458 \overline{) 43744}$
 $\underline{43744}$
 $5476.6 \overline{) 335600}$
 $\underline{328596}$
 $54772.1 \overline{) 700400}$
 $\underline{644421}$
 $547722.2 \overline{) 15267900}$
 $\underline{10954444}$
 4313456

Examples

1. There is a circle whose diameter is 4 feet; what is the diameter of one 4 times as large Ans. 8 feet.

$$\begin{array}{r}
 4 \\
 4 \\
 \hline
 16 \\
 4 \\
 \hline
 64 \\
 64
 \end{array}$$

Ans. 8

2. A has a circular yard of 100 feet diameter. but wishes to enlarge it to one of 3 times that area; what will the diameter of the enlarged be one measure.

Ans. 173.2+
 100
 100
 10000
 3
 30000
 $2.7 \overline{) 200}$
 $\underline{189}$
 $34.3 \overline{) 1100}$
 $\underline{1029}$
 $346.2 \overline{) 7100}$
 $\underline{6924}$
 176

3. If the diameter of a circle be 12 inches, what will be the diameter of another circle of half the size.
 Ans. 8.48+ inches.

$$\begin{array}{r}
 12 \\
 2 \overline{) 144} \\
 \underline{72} \\
 72 \\
 64 \\
 \hline
 165 \overline{) 800} \\
 \underline{660} \\
 168.8 \overline{) 14000} \\
 \underline{13504} \\
 496
 \end{array}$$

Square Square Root

1. What 1. When the area is 160
what is the diameter. Ans. 14.2729474

$$\begin{array}{r}
 160 (12.64911+ \\
 22) 60 \\
 \underline{44} \\
 246) 1600 \\
 \underline{1476} \\
 2524) 12400 \\
 \underline{10096} \\
 2528.9) 230400 \\
 \underline{227601} \\
 25298.1) 249900 \\
 \underline{252981} \\
 252982.1) 2691900 \\
 \underline{2529821}
 \end{array}$$

$$\begin{array}{r}
 12.64911+ \\
 1.12837 \\
 \hline
 8854377 \\
 3794733 \\
 10119288 \\
 2529822 \\
 1264911 \\
 1264911 \\
 \hline
 14.2728762504 \text{ Ans}
 \end{array}$$

$$\begin{array}{r}
 12.64911+ \\
 1.12837 \\
 \hline
 8854377 \\
 3794733 \\
 10119288 \\
 2529822 \\
 1264911 \\
 1264911 \\
 \hline
 2) 14.2728762504 \\
 7.1364. \text{ Ans Answer}
 \end{array}$$

Application.

1. If an army of 20736 men is
formed into a square column;
how many men will each front
contain: Ans. 144 men.

$$\begin{array}{r}
 20736 (144 \text{ Ans.} \\
 24) 107 \\
 \underline{96} \\
 284) 1136 \\
 \underline{1136}
 \end{array}$$

2. What length of a halter will
be sufficient to fasten a horse from it require to lay the floor of a
a post in the centre so that he may be
able to graze upon an acre of grass.
and no more: Ans. 4.1364 perches or
or 117 ft. 9 inches.

$$\begin{array}{r}
 160 (12.64911+ \\
 22) 60 \\
 \underline{44} \\
 246) 1600 \\
 \underline{1476} \\
 2524) 12400 \\
 \underline{10096} \\
 2528.9) 230400 \\
 \underline{227601} \\
 25298.1) 249900 \\
 \underline{252981} \\
 252982.1) 2691900 \\
 \underline{2529821}
 \end{array}$$

2. How many feet of boards will
be required to lay the floor of a
room that is 25 feet square:

$$\begin{array}{r}
 \text{Ans. 625 feet} \\
 25 \\
 25 \\
 \hline
 125 \\
 50 \\
 \hline
 625. \text{ Ans.}
 \end{array}$$

Square Root Examples

3. A certain square pavement contains 194136 square stones all of the same size; how many are contained in one of its sides: Ans. 440.

$$\begin{array}{r} 194136 \text{ (440 Ans.)} \\ 16 \\ 84 \overline{) 371} \\ \underline{336} \\ 884 \overline{) 3536} \\ \underline{3536} \end{array}$$

6. What is the square root of 964.5192360241: Ans. 31.05671.

$$\begin{array}{r} 964.5192360241 \text{ (31.05671 Ans.)} \\ 6.1 \overline{) 64} \\ \underline{61} \\ 6205 \overline{) 35192} \\ \underline{31025} \\ 62106 \overline{) 416736} \\ \underline{372636} \\ 621124 \overline{) 4410002} \\ \underline{4347889} \\ 6211341 \overline{) 6211341} \\ \underline{6211341} \end{array}$$

4. In a triangular piece of ground containing 600 perches one of the shortest sides measures 40 perches and the other 30: what is the length of the longest side: Ans. 50 perches.

$$\begin{array}{r} 40 \\ 110 \\ \hline 1600 \end{array} \quad \begin{array}{r} 30 \\ 30 \\ \hline 900 \\ 1600 \\ \hline 2500 \text{ (50 Ans.)} \\ 25 \\ \hline 10 \overline{) 00} \end{array}$$

7. What is the square root of 1030892198.4001: Ans. 32107.51.

$$\begin{array}{r} 1030892198.4001 \text{ (32107.51 Ans.)} \\ 6.2 \overline{) 130} \\ \underline{124} \\ 641 \overline{) 689} \\ \underline{641} \\ 64204 \overline{) 482198} \\ \underline{449449} \\ 642145 \overline{) 3274940} \\ \underline{3210725} \\ 6421501 \overline{) 6421501} \\ \underline{6421501} \end{array}$$

5. Two gentlemen set out from a slough at the same time: one of them travels 84 miles due north, and the other 60 miles due west: what distance are they asunder: Ans. 97.75 miles.

$$\begin{array}{r} 84 \\ 84 \\ \hline 672 \\ 7056 \end{array} \quad \begin{array}{r} 50 \\ 50 \\ \hline 2500 \\ 4056 \\ \hline 2556 \text{ (97.75 Ans.)} \\ 21 \\ \hline 18.7 \overline{) 1456} \\ \underline{1309} \\ 194.7 \overline{) 14700} \\ \underline{13629} \\ 1954.5 \overline{) 107100} \\ \underline{97725} \\ 9375 \end{array}$$

Just. C. H.
L. H.
S.

Cube Root

1. What is the cube root of 18228544 (36 Ans.)

the greatest cube in 18 = 27
 square of 3x3 = 27.36
 add 540
 compl divider 3276
 2nd defect 3888
 add 4320
 2nd complet 393136

18228544
 27
 21228
 19656
 1572544
 1572544

36
 3
 9
 27

63
 18
 30
 540

36
 216
 108
 1296
 3588

36
 4
 144
 4320

2. What is the cube root of 13824. Ans. 24

13824 (24 Ans.)

1216 | 3824 2
 240 | 5824 4
 1456 | 12
 12
 30
 240

3. What is the cube root of 373248. Ans. 72

373248 (72 Ans)

14704 | 30248
 420 | 30248
 15124 | 343

72
 49
 343

72
 14
 30
 1440

Cube Root Cube R.

4. What is the cube root of 5735339. Ans. 179.

$$\begin{array}{r}
 5735339 \text{ (179 Ans)} \\
 \begin{array}{r}
 179 \\
 \times 179 \\
 \hline
 1513 \\
 3111 \\
 \hline
 31921 \\
 5735339 \\
 \hline
 5735339 \\
 \hline
 0
 \end{array}
 \end{array}$$

5. What is the cube root of 84604519. Ans. 439.

$$\begin{array}{r}
 84604519 \text{ (439 Ans)} \\
 \begin{array}{r}
 439 \\
 \times 439 \\
 \hline
 13171 \\
 11562 \\
 \hline
 191971 \\
 84604519 \\
 \hline
 84604519 \\
 \hline
 0
 \end{array}
 \end{array}$$

5. What is the cube root of 84604519.

6. What is the cube root of 24054036008. Ans. 3002.

$$\begin{array}{r}
 24054036008 \text{ (3002 Ans)} \\
 \begin{array}{r}
 3002 \\
 \times 3002 \\
 \hline
 6004 \\
 600400 \\
 \hline
 18012004 \\
 24054036008 \\
 \hline
 24054036008 \\
 \hline
 0
 \end{array}
 \end{array}$$

7. What is the cube root of 122615324232. Ans. 4968.

$$\begin{array}{r}
 122615324232 \text{ (4968 Ans)} \\
 \begin{array}{r}
 4968 \\
 \times 4968 \\
 \hline
 39744 \\
 993600 \\
 \hline
 24789120 \\
 122615324232 \\
 \hline
 122615324232 \\
 \hline
 0
 \end{array}
 \end{array}$$

Cube Root

8. What is the cube root of 22069810125. Ans. 2805

22069810125 (2805 Ans)

$$\begin{array}{r}
 1264 \overline{) 14069} \\
 \underline{1180} \\
 1744 \\
 \underline{23520025} \\
 42000 \\
 \underline{23562025}
 \end{array}$$

9. What is the cube root of 219365324491. Ans. 6031

219365324491 (6031 Ans)

$$\begin{array}{r}
 216 \overline{) 3365324} \\
 \underline{3256224} \\
 109100791 \\
 \underline{109100791}
 \end{array}$$

10. What is the cube root of 673373097125. Ans. 8765

673373097125 (8765 Ans)

$$\begin{array}{r}
 512 \overline{) 161373} \\
 \underline{146503} \\
 2270736 \\
 \underline{15660} \\
 2286396 \\
 \underline{230212825} \\
 131400 \\
 \underline{230214225}
 \end{array}$$

11. What is the cube root of 12.944875. Ans. 2.35

12.944875 (235 Ans)

$$\begin{array}{r}
 1209 \overline{) 4977} \\
 \underline{180} \\
 1389 \\
 \underline{158725} \\
 3450 \\
 \underline{162175}
 \end{array}$$

Cult School James

mmmmmmmmmm
mmmmmmmmmm

12. What is the cube root of 15926.972504 Ans. 25.16 +

$$\begin{array}{r}
 15926.972504 \text{ (25.16 + Ans.)} \\
 \underline{1225} \quad 7926 \\
 300 \quad 7625 \\
 \hline
 1525 \quad 301972 \\
 184501 \quad 188251 \\
 450 \\
 \hline
 188251 \quad 113421504 \\
 18900336 \quad 113673096 \\
 45180 \\
 \hline
 18945516 \quad 48408
 \end{array}$$

13. What is the cube root of 36155.024576 Ans. 33.06 +

$$\begin{array}{r}
 36155.024576 \text{ (33.06 + Ans.)} \\
 \underline{27} \\
 2709 \quad 9155 \\
 270 \quad 8937 \\
 \hline
 2979 \quad 218027576 \\
 32670036 \quad 196376616 \\
 59400 \\
 \hline
 32429436 \quad 21650960
 \end{array}$$

14. What is the cube root of 0.53258279. Ans. 376 +

$$\begin{array}{r}
 .053258279 \text{ (376 + Ans.)} \\
 \underline{27} \\
 2749 \quad 26258 \\
 630 \quad 23653 \\
 \hline
 3379 \quad 2605279 \\
 410736 \quad 2504876 \\
 6660 \\
 \hline
 414396 \quad 100903
 \end{array}$$

15. What is the cube root of .001906624 Ans. 124

$$\begin{array}{r}
 .001906624 \text{ (124 Ans)} \\
 \underline{304} \quad 906 \\
 80 \quad 728 \\
 \hline
 364 \quad 178624 \\
 43216 \quad 178624 \\
 1440 \\
 \hline
 44656
 \end{array}$$

~~mmmm~~ Cube Root

16. What is the cube root of 000000729. Ans. 009⁹

$$\begin{array}{r} 000000729 \text{ (009 Ans.)} \\ \underline{729} \end{array}$$

17. What is the cube root of 2. Ans. 1.25 +

2 (1.25 Ans.)

$$\begin{array}{r|l} 309 & 1000 \\ 60 & 738 \\ \hline 369 & 262000 \\ & 225125 \\ \hline 43225 & 36875 \\ & 1800 \\ \hline 45025 & \end{array}$$

Cube Root

James H. Cornick

Cube Root Root

2. What is the cube root of $12\frac{19}{24}$: Ans. $2\frac{1}{3}$

$$\begin{array}{r} 12\frac{19}{24} \\ 24 \overline{) 2724} \\ \underline{93} \\ 24 \end{array}$$

$$\begin{array}{r} 343(7 \\ 343 \end{array}$$

$$\begin{array}{r} 24(3)7(2\frac{1}{3}) \text{ Ans.} \\ \underline{24} \quad \underline{6} \\ 1 \\ 3 \end{array}$$

2. What is the cube root of $405\frac{28}{125}$: Ans. $7\frac{2}{5}$

$$\begin{array}{r} 405\frac{28}{125} \\ 125 \overline{) 2033} \\ \underline{812} \\ 405 \\ \underline{50653} \\ 125 \end{array}$$

$$\begin{array}{r} 50653(37 \\ 24 \overline{) 2749} \\ \underline{630} \\ 3379 \end{array}$$

$$\begin{array}{r} 125(5)37(7\frac{2}{5}) \text{ Ans.} \\ \underline{125} \quad \underline{35} \\ 2 \\ 5 \end{array}$$

SSS Surds. SSS

4. What is the cube root of $7\frac{1}{5}$: Ans. $1.93+$

$$\begin{array}{r} 5 \overline{) 1.0} \\ 7.200(1.93 \text{ Ans} \end{array}$$

$$\begin{array}{r} 381 \overline{) 6200} \\ \underline{270} \quad \underline{5859} \\ 651 \overline{) 341000} \\ \underline{110409} \quad \underline{24100} \\ 1710 \overline{) 334257} \\ \underline{112419} \quad \underline{3743} \end{array}$$

5. What is the cube root of $8\frac{1}{4}$: Ans. $2.054+$

$$\begin{array}{r} 7 \overline{) 5.00} \\ 8.714285714(2.054+ \text{ Ans} \end{array}$$

$$\begin{array}{r} 120025 \overline{) 714285} \\ \underline{3000} \quad \underline{615125} \\ 123025 \overline{) 99160714} \\ \underline{12604549} \quad \underline{88554193} \\ 43050 \overline{) 10606521} \\ \underline{12650599} \end{array}$$

6. What is the cube root of $9\frac{1}{6}$: Ans. $2.092+$

$$\begin{array}{r} 6 \overline{) 1.00} \\ 9.166666666(2.092+ \text{ Ans.} \end{array}$$

$$\begin{array}{r} 120081 \overline{) 1166666} \\ \underline{5400} \quad \underline{1129329} \\ 125481 \overline{) 34337666} \\ \underline{13104304} \quad \underline{26233688} \\ 12540 \overline{) 11103978} \\ \underline{13116844} \end{array}$$

Cube Root Tables *McMurry*

Examples. SSS

1. If the solid content of a globe is 10648. what is the side of a cube of equal solidity. Ans. 22.

10648 (22 Ans.

$$\begin{array}{r} 1204 \overline{) 2648} \\ 120 \overline{) 2648} \\ \hline 1324 \end{array}$$

2. If the solid content of a globe is 389017. what is the side of a cube of equal solidity. Ans. 73.

389017 (73 Ans

$$\begin{array}{r} 14709 \overline{) 46017} \\ 630 \overline{) 46017} \\ \hline 15339 \end{array}$$

Examples. SSS

1. There is a cubical vessel whose side is two feet; I demand the side of another vessel which shall contain three times as much. Ans. 2 feet 10 inches and $\frac{2}{3}$ nearly.

$$\begin{array}{r} \text{in} \\ 24 \\ 24 \\ \hline 96 \\ 48 \\ \hline 676 \\ 24 \\ \hline 2304 \\ 1152 \\ \hline 13824 \text{ Inches} \\ 41472 (34.6 \text{ ans} \\ 27 \\ \hline 2716 \overline{) 114472} \\ 360 \overline{) 12304} \\ \hline 3046 \overline{) 2168000} \\ 346836 \overline{) 2117736} \\ 6120 \overline{) 50264} \\ \hline 352956 \end{array}$$

$$\begin{array}{r} 12 \overline{) 34.6} \\ 2.10, \frac{2}{3} \text{ inches} \end{array}$$

2. There is a cubical vessel whose side is 1 foot. require the side of another vessel that shall contain three times as much. Ans. 17.306 inches.

$$\begin{array}{r} \text{in} \\ 12 \\ 12 \\ \hline 144 \\ 12 \\ \hline 1728 \\ 3 \\ \hline 5184 (17.306 \text{ in. ans} \\ 1 \\ \hline 349 \overline{) 4184} \\ 210 \overline{) 3913} \\ \hline 559 \overline{) 241000} \\ 86709 \overline{) 264717} \\ \hline 1530 \overline{) 6288000000} \\ 88239 \overline{) 5389088616} \\ \hline 897840036 \overline{) 893911384} \\ 311400 \overline{) 898181436} \end{array}$$

Cube Root

1. If a ball of 6 inches diameter weigh 32 lb. what will one of the same metal weigh whose diameter is 3 inches. Ans. 4 lb.

Application.

$$\begin{array}{r} \text{in} \\ 6 \\ \hline 36 \\ 216 \end{array} : 32 :: \begin{array}{r} \text{in} \\ 3 \\ \hline 9 \\ 27 \\ 81 \end{array}$$

$$216 \overline{) 81} \text{ 4 lb. Ans.}$$

2. What is the side of a cubical mound equal to one 288 feet long 216 broad and 144 high. Ans. 144 feet.

$$\begin{array}{r} 288 \\ 216 \\ \hline 1728 \\ 288 \\ \hline 576 \\ 62208 \\ 48 \\ \hline 497664 \\ 248832 \\ \hline 2985984 \end{array} \quad \begin{array}{l} 144 \text{ feet } \text{Ans.} \end{array}$$

$$\begin{array}{r} 316 \\ 120 \\ \hline 436 \\ 58816 \\ 1680 \\ \hline 60496 \end{array} \quad \begin{array}{l} 1985 \\ 1744 \\ \hline 2341984 \\ 2341984 \\ \hline \end{array}$$

3. There is a stone of a cubic form which contains 389017 solid feet: what is the superficial content of one of its sides. Ans. 5329 feet.

$$\begin{array}{r} 389017 \\ 389017 \\ \hline 2423119 \\ 389017 \\ \hline 35011530 \\ 3112136 \\ \hline 1167051 \\ 151334226289 \end{array} \quad \begin{array}{l} 5329 \text{ feet } \text{Ans.} \end{array}$$

$$\begin{array}{r} 7509 \\ 450 \\ \hline 7959 \\ 842404 \\ 3180 \\ \hline 845884 \\ 84907281 \\ 143640 \\ \hline 85050921 \end{array} \quad \begin{array}{l} 26334 \\ 23844 \\ \hline 2487226 \\ 1691768 \\ \hline 765458289 \\ 765458289 \\ \hline \end{array}$$

Cube Root D

4. What is the difference between half a solid foot, and a solid half foot. *Ans. 3 half feet.*

$$\begin{array}{r}
 12 \\
 144 \\
 12 \\
 2 \overline{) 1728} \\
 \underline{864} \\
 216 \\
 216 \overline{) 648} (3 \text{ Ans.} \\
 \underline{648}
 \end{array}$$

$$\begin{array}{r}
 6 \\
 36 \\
 6 \\
 216
 \end{array}$$

5. In a cubical foot, how many cubes of 6 inches, and how many of 4 are contained therein. *A. 8 of 6 inches and 27 of 4 inches.*

$$\begin{array}{r}
 6 \\
 36 \\
 6 \\
 216
 \end{array}$$

$$\begin{array}{r}
 216 \overline{) 1728} (8 \text{ of 6 inches} \\
 \underline{1728}
 \end{array}$$

$$\begin{array}{r}
 4 \\
 16 \\
 4 \\
 64
 \end{array}$$

$$\begin{array}{r}
 64 \overline{) 1728} (27 \text{ of 4 inches} \\
 \underline{1728} \\
 448 \\
 448
 \end{array}$$

2. What is the cube root of 13824. *Ans. 24*
 $13824 (24 \text{ Ans.}$

$$\begin{array}{r}
 1216 \overline{) 5824} \\
 \underline{240} \\
 1436
 \end{array}$$

$$\begin{array}{r}
 24 \\
 24 \\
 96 \\
 48 \\
 \hline
 576 \\
 24 \\
 \hline
 2304 \\
 1152 \\
 \hline
 13824
 \end{array}$$

Proof

Proof

Regression James. *W. G. M. M. M.*

Case 1.

1. A merchant bought 50 yards of Linen. at 2 cents for the first yard
 . 4 for the second. 6 for the third. &c. increasing two cents every
 yard. what was the price of the last yard. how much the whole
 amount. and what the average price per yard.

246 50 number of Terms less one

Multiply $\frac{49}{2}$ common difference
 add $\frac{98}{2}$ first term
 $\frac{100}{2}$ last term
 $\frac{102}{2}$ sum of the two extremes
 50 number of terms
 $2 \overline{) 100}$
 $50 \overline{) 2550}$ Sum of all the terms
 51 cents per yard

Ans { 100 cents the last yard
 2550 do the whole amount
 50 do the average price per yard

2. Bought 20 yards calico at 3 cents for the first yard. 6 for the second. 9 for
 the third. &c. what did the whole cost. Ans. 6 dolls. 30 cents.

369 20
 $\frac{19}{1}$
 $\frac{13}{3}$
 add $\frac{54}{3}$
 $\frac{60}{3}$ last
 $\frac{63}{3}$
 $\frac{20}{2}$
 $2 \overline{) 1260}$ Ans
 630

Proposition

3. If 100 apples were laid two yards distant from each other in a right line, and a basket placed two yards distant from the first apple, what distance must a person travel to gather them singly into the basket: Ans. 11 miles 3 furlongs 180 yards.

11 3 16

$$\begin{array}{r}
 100 \\
 \underline{99} \\
 1 \\
 396 \\
 \underline{4} \\
 400 \\
 \underline{4} \\
 404 \\
 \underline{100} \\
 2) 40400 \\
 1760 \overline{) 20200} \quad 11 \text{ miles} \\
 \underline{1760} \\
 2600 \\
 \underline{1760} \\
 840 \\
 220 \overline{) 840} \quad 3 \text{ furlongs} \\
 \underline{660} \\
 180 \text{ yards}
 \end{array}$$

4. A agreed to serve B 10 years, at the rate of 20 dollars for the first year, 30 for the second, 40 for the third, &c. what had he the last year, how much for the whole time, and what per annum. Ans. 110 dolls. for the last year, 650 dolls. the whole amount, and 65 dolls. per annum.

20 30 40

$$\begin{array}{r}
 19 \\
 \underline{9} \\
 10 \\
 \underline{90} \\
 20 \\
 \underline{110} \text{ last} \\
 20 \text{ first term} \\
 \underline{130} \\
 10 \\
 2) 1300 \\
 10 \overline{) 650} \text{ Ans.} \\
 65 \text{ per annum.}
 \end{array}$$

5. A sold to B 1000 acres of land, at 10 cents for the first acre, 20 for the second, 30 for the third, &c.; what was the price of the last acre, and what did the whole come to

Ans. { 100 dolls. the last acre
50050 do. whole cost

10 20 30

$$\begin{array}{r}
 1000 \\
 \underline{999} \\
 10 \\
 \underline{9990} \\
 10 \\
 \underline{10000} \text{ last term} \\
 10 \\
 \underline{10010} \\
 1000 \\
 2) 10010000 \\
 5005000
 \end{array}$$

Ans. { 100 dolls. the last acre
50050 do. whole cost.

Progression & Progressio ^{N 12}

III Case 2. III

1. A is to receive from B a certain sum to be paid in 11 several payments in arithmetical progression; the first payment to be 20 dollars. and the last to be 100 dollars; what is the common difference, what was each payment, and how much the whole debt

Operation. ^{last term} 100 ^{first term} 20 ^{the difference} 80
No. of terms 11-1=10) 80

8 common difference

$$20 + 10 \times 8 = 100 \text{ first payment}$$

$$20 + 8 = 28 \text{ second do.}$$

$$28 + 8 = 36 \text{ third do. \&c.}$$

2. There are 21 persons whose ages are equally distant from each other, in arithmetical progression; the youngest is 20 years old. and the eldest 60; what is the common difference of their ages, and the age of each man;

$$21 - 1 = 20 \text{ } \begin{array}{r} 60 \\ 20 \\ \hline 40 \end{array} \text{ common difference}$$

$$20 + 60 \times 10 = 1200$$

20 first payment

Ans. $\begin{cases} 20 + 2 = 22 \text{ second do.} \\ 22 + 2 = 24 \text{ the third. \&c.} \end{cases}$

3. A man is to travel from Pittsburg to a certain place in 12 days, and to go but 3 miles the first day, increasing each days Journey in arithmetical progression, making the last days travelling 58 miles; what is the daily increase, and what the whole distance.

$$12 - 1 = 11 \text{ } \begin{array}{r} 58 \\ 3 \\ \hline 55 \end{array} \text{ common difference}$$

$$2 \text{) } 10 \text{ } 5 \text{ miles daily increase}$$

$$3 + 58 \times 6 = 366 \text{ miles. whole distance}$$

Ans. $\begin{cases} 5 \text{ miles daily increase} \\ 366 \text{ miles. whole distance.} \end{cases}$

Geometrical Progression

Example. 111 1. Suppose 20 yards of broad cloth was sold at 4 mells for the first yard. 12 for the second. 36 for the third. &c. what did the cloth come to and what was gained by the sale, supposing the prime cost to have been 15 dollars per yard:

| | | | | |
|---------|---|---|----|----|
| | P | P | P | P |
| Indices | 1 | 2 | 3 | 4 |
| Ratio | 3 | 9 | 27 | 81 |

| | | |
|--------------|-------------|-------------------------|
| | 81 | |
| | 81 | |
| | 648 | |
| | 6561 | = the 8th power |
| | 6561 | |
| | 6561 | |
| | 39366 | |
| | 32805 | |
| | 39366 | |
| | 43046721 | = 16th power |
| | 27 | = 3d power |
| | 301327044 | |
| | 86093442 | |
| | 1162261467 | = 19th power |
| | 27 | = first term |
| | 4649045868 | = 20th or last term |
| | 27 | = ratio |
| | 13947137601 | |
| | 27 | = first term |
| | 4649045868 | |
| Ratio 3-1=2) | 13947137601 | |
| dolls. | 6973568800 | first cost of the cloth |
| | 30000 | |
| | 6973268800 | gain. |

2. A father gave his daughter, who was married on the first day of January, one dollar towards her portion, promising to double it on the first day of every month for one year; what is the amount of her whole portion. Ans. 4095 dollars.

Geometrical Progression

$$\begin{array}{r}
 1 \quad 2 \quad 3 \quad 4 \quad 5 \\
 2 \quad 4 \quad 8 \quad 16 \quad 32 \\
 \hline
 32 \\
 64 \\
 \hline
 96 \\
 1024 \\
 \hline
 2048 \\
 \hline
 4096 \\
 \hline
 4095 \text{ Ans}
 \end{array}$$

3. A merchant sold 15 yards of satin; the first yard for 1s. the second for 2s. the third for 4s. &c. in geometrical progression; what was the price of the 15 yards. Ans. 1638s. 4d.

$$\begin{array}{r}
 1 \quad 2 \quad 3 \quad 4 \quad 5 \\
 2 \quad 4 \quad 8 \quad 16 \quad 32 \\
 \hline
 32 \\
 64 \\
 \hline
 96 \\
 1024 \\
 \hline
 16 \\
 6144 \\
 \hline
 1024 \\
 16384 \\
 \hline
 32768 \\
 \hline
 2032768 \text{ Ans}
 \end{array}$$

11. A goldsmith sold 1 pound of gold at 1 cent for the first ounce. 16 for the second. 16 for the third. &c. what did it come to. and what did he gain. supposing he gave 20 dollars per ounce. Ans. he sold it for 5592 1/4 dollars 5 cents. and gained 5568 1/4 dollars 5 cents.

$$\begin{array}{r}
 1 \quad 2 \quad 3 \quad 4 \\
 16 \quad 64 \quad 256 \\
 \hline
 256 \\
 1536 \\
 \hline
 1280 \\
 612 \\
 \hline
 65536 \\
 64 \\
 \hline
 262144 \\
 393216 \\
 \hline
 4194304 \\
 16777216 \\
 \hline
 16777216 \\
 559214 \\
 \hline
 559214.05 \\
 24000 \\
 \hline
 556814.05
 \end{array}$$

Ans

Geometrical Progression

$$\begin{array}{r}
 4625597484987 \\
 81 \\
 \hline
 4625597484987 \\
 61004779879896 \\
 \hline
 617673396283947 \\
 3 \\
 \hline
 18 \quad 5302018851841 \\
 3-1-2 \quad 18 \quad 53020188851840 \\
 \hline
 9265100944259.2.0 \quad \text{Ans.}
 \end{array}$$

Ans

7. What sum would purchase the same horse, with the same number of shoes and nails, at 1 mill for the first nail & for the second 16 for the third. &c. in a quadruple ratio of geometrical progression to the last: Ans. 6148914691236517dolls. 20cts. 5 mls.

$$\begin{array}{ccccccc}
 1 & 2 & 3 & 11 & 5 & 6 & 7 \\
 16.64.256.1024.11096.16384.65536
 \end{array}$$

$$\begin{array}{r}
 65536 \\
 393216 \\
 196608 \\
 327680 \\
 327680 \\
 293216 \\
 \hline
 1129496 \quad 7296 \\
 4096 \\
 \hline
 2576980 \quad 3776 \\
 3865470 \quad 5664 \\
 171798691 \quad 840 \\
 \hline
 17 \quad 592186 \quad 44416 \\
 1024 \\
 \hline
 70368744177664 \\
 3512437208882 \\
 175921860444160 \\
 \hline
 1801439850948 \quad 1984 \\
 256 \\
 \hline
 108086391056891904 \\
 90071992547409920 \\
 36028797018963968 \\
 \hline
 11611686018427387904 \\
 4 \\
 \hline
 184467440737095516 \quad 16 \\
 1 \\
 \hline
 1-1-3 \quad 184467440737095516 \quad 15 \\
 \hline
 6148914691236517,20.5 \quad \text{Ans}
 \end{array}$$

Arithmetical Progression

Q. Sold 30 yards of silk velvet. at 2 pence for the first yard. 6 for the second. 18 for the third. &c. and these disposed of at 1000 for a farthing; what did the ~~the~~ ^{the} net amount to; and what was gained by the sale. supposing the prime cost to have been 100l. per yard:

Ans. { Amount 214469429l. 5s. 3½d
Gained 214466929l. 5s. 3½d

1 2 3 4 5 6 7
3. 9. 27. 81. 243. 729. 2187
2187
15504
17246
2187
4374
4752969
4782969
43046721
28097514
43046721
4565938
38263752
331180783
19131876
22876792454961
68630377364883
37260454729766
411782264189298
3-1-2) 411782264189298
4) 205891132094648
12) 51472783023-2
20) 428939858(5=3
214469429-5=3½d
3000
214466929-5=3½d

Ans.

Position Position James

III Examples. III 1. A school master being asked how many scholars he had. said if I had as many half as many. and one quarter as many more. I should have 132: how many had he:

Operation
Suppose he had 110

as many 110
half as many 55
one quarter as many 27 1/2

as 110 : 110 :: 132 : 118 Ans.

proof 118
118
2 1/2
12
132

2. It is required to divide a certain sum of money among 4 persons. in such a manner that the first shall have 1/3. the second 1/4. the third 1/6. and the fourth the remainder. which is 28 dolls; what was the sum.

Suppose 72

1/3 is 24
1/4 is 18
1/6 is 12
54

Errata 72 :: 28 : 112 Ans. 112 dolls.

proof 112
1/3 is 37 1/3
1/4 is 28
1/6 is 18 2/3
84

28 last share.

3. A. B. and C. buy a carriage for 340 dollars. of which A pays three times as much as B. and B four times as much as C; what did each pay. C paid 20 dolls.

Ans. C 20

50
20
60

85 : 5 :: 340

85 | 340
170
170

20 C's

80 B's

3 A's

Ans. 240

Position & Position

4. What is the sum of which $\frac{1}{11}$, $\frac{1}{5}$ and $\frac{1}{6}$ make 148 dollars:

Ans. 240 dolls.

$$\begin{array}{r} 60 \\ \frac{1}{11} \text{ is } 15 \\ \frac{1}{5} \text{ is } 12 \\ \frac{1}{6} \text{ is } 10 \\ \hline 37 \end{array}$$

$$37 : 60 :: 148$$

$$\begin{array}{r} 60 \\ 37 \overline{) 2220} \quad \text{Ans.} \\ \underline{74} \\ 148 \\ \underline{148} \\ 0 \end{array}$$

5. A person having spent $\frac{1}{2}$ and $\frac{1}{3}$ of his money, had $26\frac{2}{3}$ dolls. left: what had he at first: Ans. 160 dolls.

$$\begin{array}{r} 36 \\ \frac{1}{2} \text{ is } 18 \\ \frac{1}{3} \text{ is } 12 \\ \hline 30 \end{array}$$

$$6 : 36 :: 26\frac{2}{3}$$

$$\begin{array}{r} 216 \\ 72 \\ \underline{24} \\ 6 \overline{) 960} \quad \text{Ans.} \\ \underline{160} \end{array}$$

$$\begin{array}{r} 36 \\ 3 \overline{) 72} \\ \underline{24} \end{array}$$

6. A, B. and C. talking of their ages. B said his age was once and a half the age of A: C said his was twice, and one-tenth the age of B. and that the sum of their ages was 93: what was the age of each:

$$\begin{array}{r} A \quad 20 \\ \frac{1}{2} \quad 10 \\ \hline B \quad 30 \\ \frac{2}{3} \quad 20 \\ \hline C \quad 40 \\ \frac{1}{10} \quad 4 \\ \hline 100 \\ 5 \\ \hline 105 \\ 30 \\ \hline 135 \\ 20 \\ \hline 155 \end{array}$$

$$155 : 20 :: 93$$

$$\begin{array}{r} 20 \\ 155 \overline{) 1550} \quad \text{Ans.} \\ \underline{155} \\ 310 \\ \underline{310} \end{array}$$

$$\begin{array}{r} B \quad 18 \\ \frac{1}{2} \quad 9 \\ \hline C \quad 36 \\ \frac{1}{10} \quad 3.6 \\ \hline 60 \\ 3 \\ \hline 63 \end{array} \quad \text{Ans}$$

$$\begin{array}{r} 60 \\ 3 \\ \hline 63 \end{array} \quad \text{Ans}$$

7. Seven-eighths of a certain number exceeds four fifths by 6: what is that number: Ans. 80

$$\begin{array}{r} 16 \\ 8 \overline{) 112} \\ \underline{112} \\ 0 \end{array}$$

1.2) 960 (500000)

8. A gentleman bought a chaise, horse, and harness for 360 dollars; the horse came to twice the price of the harness, and the chaise to twice the price of the horse and harness together: what did he give for each: (80 dollars for the horse)

$$\begin{array}{r} 10 \\ \underline{10} \\ 10 \\ \underline{10} \\ 20 \\ \underline{10} \\ 30 \\ \underline{2} \\ 60 \\ 20 \\ \underline{10} \end{array}$$

$$\begin{array}{r} 90 \overline{) 3600} \\ \underline{360} \\ 0 \end{array} \quad \begin{array}{l} 10 : 3600 \\ 90 \overline{) 3600} \end{array} \quad \begin{array}{l} 10 : 3600 \\ 90 \overline{) 3600} \end{array} \quad \begin{array}{l} 10 : 3600 \\ 90 \overline{) 3600} \end{array} \quad \begin{array}{l} 10 : 3600 \\ 90 \overline{) 3600} \end{array}$$

e. Am. { 80 dolls. for the horse
 40 harness
 210 Chaise

Harness 40 Harness
 2
 80 Harness
 40
 120
 240 Chase

9. A gentleman being asked the price of his carriage answered, that $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, and $\frac{1}{16}$ of its price was 228 dollars: what was the price of the carriage: Ans. 240 dollars.

$$\begin{array}{r} 60 \\ \hline \frac{1}{3} \text{ is } 20 \\ \frac{1}{4} \text{ is } 15 \\ \frac{1}{5} \text{ is } 12 \\ \frac{1}{6} \text{ is } 10 \\ \hline \end{array}$$

$\frac{60}{\frac{1}{3} \text{ h } 20}$
 $\frac{60}{\frac{1}{4} \text{ h } 15}$
 $\frac{60}{\frac{1}{5} \text{ h } 12}$
 $\frac{60}{\frac{1}{6} \text{ h } 10}$
 $54:60::22\frac{2}{3}$

$$\begin{array}{r} 54 \overline{) 13650} \quad (240 \text{ h } 11 \text{ m}) \\ \underline{114} \\ 228 \\ \underline{228} \\ 0 \end{array}$$

10. A saves $\frac{1}{3}$ of his wages. but B who has the same salary, by spending twice as much as A. sinks 50 dollars a year: what is their annual salary: Ans. 150 dollars each

$\frac{1}{3} \frac{30}{10:30::50}$

$10 \overline{) 1500} \begin{array}{r} 30 \\ 10 \\ \hline 50 \\ 50 \\ \hline 0 \end{array} \quad \text{Ans.}$

Scutle Position

1. A father leaves his estate to be divided among his three sons: A, B, and C, in the following manner: viz. A is to have one half wanting 50 dollars. B one third, and C 10 dolls. less than B: what was the sum left, and what was each son's share:

Operation.

1st. Suppose 240 dollars.

then $240 \div 2 - 50 = 70$ A's part

$240 \div 3 = 80$ B's part

$80 - 10 = 70$ C's part

B's share 80 — 10 =

Sum of all the parts 20

20 cr. too little.

2d. Suppose 300 dollars.

~~then 300 dollars.~~

then $300 \div 2 - 50 = 100$ A's part

100 B's part

$300 \div 3 =$

90 C's part

B's share 100 — 10 =

290

10 cr. too little.

errors

1st. sup 240

20 = 6000

2d. sup 300

10 = 2400

10) 3600 360 Ans.

proof $360 \div 2 - 50 = 130$

$\div 3 = 120$

$- 10 = 110$ 360 Ans.

2. A and B have the same income: A saves the $\frac{1}{2}$ of his. but B by spending 30 dollars per annum more than A. at the end of 8 years finds himself 400 dollars in debt what is their income. and how much does each spend per annum:

Ans. { Their income is 200 doll^{rs}. per ann
A spends 175
B spends 205

Scout Position

$$\begin{array}{r}
 D \\
 150 \\
 8 \\
 \hline
 8 \overline{)1200} \\
 \underline{150} \\
 1050 \\
 \underline{240} \\
 1290 \\
 \underline{90} \\
 40 \\
 \hline
 \text{Error } 50-
 \end{array}$$

$$\begin{array}{r}
 30 \\
 8 \\
 \hline
 240
 \end{array}$$

$$\begin{array}{r}
 80 \\
 8 \\
 \hline
 8 \overline{)640} \\
 \underline{80} \\
 560 \\
 \underline{240} \\
 800 \\
 \underline{160} \\
 140 \\
 \hline
 120 \\
 \underline{50} \\
 70
 \end{array}$$

$$\begin{array}{r}
 30 \\
 8 \\
 \hline
 240
 \end{array}$$

$$\begin{array}{r}
 2d \text{ Error } 120- \\
 \underline{50} \\
 70
 \end{array}$$

1st Suppos. 150

2d Suppos. 80

$$\begin{array}{r}
 150 \\
 50 \\
 \hline
 4000
 \end{array}$$

$$\begin{array}{r}
 120 \\
 150 \\
 \hline
 6000 \\
 \underline{120} \\
 18000 \\
 \underline{4000} \\
 14000
 \end{array}$$

$$\begin{array}{r}
 8 \overline{)14000} \\
 \underline{8000} \\
 6000 \\
 \underline{2500} \\
 3500 \\
 \underline{3000} \\
 500
 \end{array}$$

their income

A. expends = 175

B. expends = 209

3. A. B. and C. would divide 100 dollars. between them. so as B may have 3 dollars more than A. and C 14 dolls more than B: how many dollars must each have:

$$\begin{array}{r}
 100 \\
 3 \\
 \hline
 3 \overline{)100} \\
 \underline{90} \\
 10 \\
 \hline
 60 \text{ err} \\
 \underline{30} \\
 30
 \end{array}$$

$$\begin{array}{r}
 100 \\
 20 \\
 3 \\
 \hline
 3 \overline{)100} \\
 \underline{60} \\
 40 \\
 \underline{30} \\
 10 \\
 \hline
 100 \\
 \underline{30 \text{ err}} \\
 70
 \end{array}$$

Ans. A 30 dollars

B 33

C 37

10

60

30

300

$$\begin{array}{r}
 20 \\
 60 \\
 \hline
 12000 \\
 \underline{3000} \\
 9000 \\
 \hline
 3000 \text{ A} \\
 \underline{300} \\
 3300 \text{ B} \\
 \underline{300} \\
 3000 \text{ C}
 \end{array}$$

Double Position

14. A. B. and C. built a house which cost 10000 dollars:
A paid a certain sum. B paid 1000 dollars more than A.
and C paid as much as both A and B: how much did each
one pay? C paid 20000 dollars.

10000

$$\begin{array}{r} 10 \\ 1000 \\ \hline 1010 \\ 10 \\ \hline 1020 \\ 1020 \\ \hline 2040 \end{array}$$
$$\begin{array}{r} 10000 \\ 2040 \\ \hline 7960 \text{ см} \\ 7920 \\ \hline 40 \end{array}$$

10000

$$\begin{array}{r} 20 \\ 1000 \\ \hline 1020 \\ 20 \\ \hline 1040 \\ 1040 \\ \hline 2080 \end{array}$$

$$\begin{array}{r} 10000 \\ 2080 \\ \hline \text{err } 7920 \text{ errors.} \end{array}$$

$$\begin{array}{r}
 10 \\
 \times 7960 \\
 \hline
 7960 \\
 79200 \\
 139200 \\
 \hline
 79200 \\
 \hline
 440)80000 \\
 \underline{2000} \quad 75 \\
 1000 \quad 65 \\
 \underline{3000} \quad 55 \\
 2000 \quad 45 \\
 \underline{5000} \quad 35
 \end{array}$$

5. A gentleman has 2 horses, and a saddle worth 50
dol. Cars. which saddle if he put on the back of the
first horse will make his value double that of the second
: but if he put it on the second horse. it will make his value
triple that of the first: what is the value of each horse:

| | | | | |
|---|---|---|--|---|
| $ \begin{array}{r} 20 \\ 30 \\ \hline 40 \\ 10 \\ \hline 60 \text{ err } 25 \\ 50 \\ \hline 75 \end{array} $ | $ \begin{array}{r} 35 \\ 50 \\ \hline 85 \\ 60 \\ \hline 25 \\ 50 \\ \hline 75 \end{array} $ | $ \begin{array}{r} 50 \\ 50 \\ \hline 100 \\ 50 \\ \hline 150 \end{array} $ | $ \begin{array}{r} 20 \\ 50 \\ \hline 100 \\ 150 \\ \hline 250 \end{array} $ | $ \begin{array}{r} \text{First horse } 30 \text{ doll.} \\ \text{Second do. 10} \\ \text{sup } 20 \text{ sup } 35 \\ 50 \\ 50 \\ \hline 100 \end{array} $ |
|---|---|---|--|---|

$$\begin{array}{r} 20 \times 25 \\ \hline 500 \\ 400 \\ \hline 1000 \end{array}$$

$$\begin{array}{r}
 20 \times 25 \\
 250 \times 50 + 75 \\
 \hline
 1250 \\
 1000 \\
 \hline
 2250
 \end{array}$$

75) 2250 (30 horse
 2250

 0

2) 1000 (50 horse
 1000

 0

Double Position

6. The head of a fish is 9 inches long and its tail is as long as its head and half its body and its body is as long as its head and tail together: what is its whole length? *Ans. 6 feet.*

1st Suppose

| | | |
|-------|---------------|-------|
| 12 | Body | 2) 24 |
| 6 | half the body | 12 |
| 9 | the head | 9 |
| 15 | the tail | 21 |
| 9 | head | 9 |
| 24 | | 30 |
| 12 | | 24 |
| err 6 | | err 6 |

| | |
|--------|----|
| 12 | 12 |
| 24 | 6 |
| 12 | 12 |
| 258 | 72 |
| 72 | |
| 6) 216 | |
| 36 | |
| 18 | |
| 9 | |
| 12) 72 | |
| 6 | |

6 feet *Ans.*

7. A laborer hired 10 days upon this condition. that he should receive 20 cents for every day he wrought. and forfeit 10 cents for every day he was idle: at settlement he received 5 dollars: how many days did he work. and how many was he idle: *Ans. wrought 30 days. idle 10.*

worked

| |
|------------|
| 20 |
| 60 |
| 60 |
| 5 |
| err 1.20 + |

idle

| |
|----|
| 40 |
| 30 |
| 6 |
| 10 |
| 60 |

worked

| |
|----------|
| 20 |
| 40 |
| 160 |
| err 2.20 |
| 1.80 |
| 1.20 |
| 3.00 |

idle

| |
|-----|
| 40 |
| 20 |
| 16 |
| 10 |
| 160 |

| | |
|------|---------------|
| 30 | 1.20 |
| 20 | 1.80 |
| 120 | 30 |
| 480 | 420 |
| 24 | 540 |
| 2880 | 6120 |
| | 2880 |
| 300 | 9000 |
| | 30 days |
| | 20 |
| | 6.00 |
| | 1.00 |
| | 5.00 received |

| |
|--------------|
| 40 |
| 30 worked |
| 10 idle |
| 10 |
| 1.00 forfeit |

Double Position

8. A and B vested equal sums in trade. A gained a sum equal to $\frac{1}{4}$ of his stock; and B lost 225 dollars. then A's money was double that of B's: what sum had each vested:

Ans. 600 dolls.

| | | | |
|---------------------------------------|-------------------------------|--|--|
| 4/500 125 625 550 err 45- | 500 225 275 2 550 | 4/800 200 1000 575 2 1150 1000 150 err 75 225 | |
|---------------------------------------|-------------------------------|--|--|

| | | |
|---|---|---|
| 500 75 800 6000 7500 225/35000 1350 00 | X | 75 150 500 75000 600 answer |
|---|---|---|

9. Divide 15 into two such parts, so that when the greater is multiplied by 11, and the less by 16, the products will be equal:
Ans. greater 12. less 3.

| | | |
|---------------|---|-------------------------------|
| 10 4 40 | X | 5 16 80 40 err 40 |
|---------------|---|-------------------------------|

| | | |
|--------------|---|---|
| 9 4 36 | X | 6 16 96 36 err 60 40 20 |
|--------------|---|---|

| | | |
|----------------------|---|---|
| 10 9 40 360 | X | 40 60 240 360 20/240 12 4 48 |
|----------------------|---|---|

| | | |
|-----------------|---|---------------|
| 12 16 144 | X | 3 16 48 |
|-----------------|---|---------------|

Ans.

10. A person being asked in the afternoon, what o'clock it was, answered that the time past from noon was equal to $\frac{2}{3}$ of the time to midnight; what o'clock was it.

Ans. 36 minutes past 10 o'clock

$$\begin{array}{r}
 H. 16 \\
 3 \dots 00 \\
 1 \dots 23 \frac{1}{3} \\
 \hline
 60 \dots 36 \frac{12}{13} \\
 96 \\
 13 \\
 \hline
 290 \\
 97 \\
 \hline
 1260 \text{ err}
 \end{array}$$

$$\begin{array}{r}
 H. 16 \\
 5 \dots 00 \\
 1 \dots 24 \frac{1}{3} \\
 \hline
 60 \dots 55 \frac{5}{13} \\
 235 \\
 13 \\
 \hline
 710 \\
 235 \\
 \hline
 3060 \text{ err} \\
 1260 \\
 \hline
 1800
 \end{array}$$

$$\begin{array}{r}
 3 \swarrow 1260 \\
 1260 \searrow \\
 \hline
 6300 \\
 3060 \\
 3 \\
 \hline
 9180 \\
 6300 \\
 \hline
 1800 \overline{) 25800} \\
 1800 \\
 \hline
 10800 \\
 60 \\
 \hline
 611800 (36 \\
 5400 \\
 \hline
 10800 \\
 10800 \\
 \hline
 10800
 \end{array}$$

Permutation James Mearns

III Examples. III

1. In how many different positions may 5 persons be placed at a table. $1 \times 2 \times 3 \times 4 \times 5 = 120$ Ans.
2. How many changes may be rung on 12 bells and how long would they be ringing but once over allowing 10 changes to be rung in one minute and the year to contain 365 days and 6 hours: Ans. 479001600 changes and would require 91 years 3 weeks 5 days and 6 hours.

$$\begin{array}{r}
 2 \\
 2 \\
 3 \\
 4 \\
 24 \\
 5 \\
 \hline
 120 \\
 720 \\
 720 \\
 5040 \\
 40320 \\
 9
 \end{array}$$

~~Combination~~

Combination. B

Examples

1. How many combinations may be made of 4 dollars out of 12:

$$\begin{array}{r} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ \hline 5040 \end{array}$$

$$\begin{array}{r} 12 \\ 11 \\ \hline 12 \\ 12 \\ \hline 132 \\ 10 \\ \hline 1320 \\ 9 \\ \hline 11880 \\ 8 \\ \hline 95040 \\ 7 \\ \hline 665280 \\ 6 \\ \hline 5040 \overline{) 3991680} \quad 492 \text{ Ans.} \\ 35280 \\ \hline 46368 \\ 45360 \\ \hline 10080 \\ 10080 \end{array}$$

15. *Chrysomelidae* (15)

1854

Purcell's

Examples

| ft. | in | '' | ''' | ''' |
|-----|----|----|-----|-----|
| 25 | 9 | 3 | 5 | 8 |
| 34 | 3 | 9 | 2 | 4 |
| 28 | 10 | 4 | 8 | 4 |
| 64 | 11 | 9 | 4 | 2 |
| 82 | 7 | 5 | 6 | 8 |
| 15 | 3 | 7 | 9 | 10 |
| 44 | 6 | 11 | 2 | 8 |
| 22 | 3 | 6 | 1 | 5 |

3188 9 5 11

| ft. | in | '' | ''' | ''' |
|-----|------|----|-----|-----|
| 246 | 6 | 3 | 10 | 5 |
| 355 | 9 | 8 | 5 | 1 |
| 539 | 10 | 9 | 5 | 8 |
| 129 | 5 | 5 | 6 | 9 |
| 895 | 110 | 5 | 11 | |
| 651 | 1 | 7 | 5 | 9 |
| 555 | 9 | 8 | 5 | 5 |
| 388 | 1110 | 10 | 9 | |

32112 9 4 79

30610 3 0 911

32112 9 4 79

Subtraction of Puodeci
mals.

Rule

| From | ft. | in | '' | ''' | ''' |
|------|-----|----|----|-----|-----|
| 125 | 4 | 8 | 8 | 2 | |
| Take | 68 | 2 | 10 | 1 | |

Rem. 56 7 0 10 1 Ans.

| ft. | in | '' | ''' | ''' |
|------|----|----|-----|-----|
| 2456 | 5 | 7 | 8 | 0 |
| 1539 | 9 | 5 | 11 | 10 |
| 916 | 8 | 18 | 2 | |
| 2456 | 5 | 7 | 8 | 0 |

3. From a board measuring
35 feet 9 inches 2 seconds. cut
24 feet 11 inches 5 seconds. and
11 thirds; what is left.

Ans. 10 ft 10 in 8 sec 8 th.

| ft | in | '' | ''' |
|----|----|----|-----|
|----|----|----|-----|

35 9 2 0

24 10 5 4

10 10 8 8 Ans.

11. A Joiner having lined sever
al rooms very ~~curiously~~ curiously
with costly materials. finds
the amount to be in square
measure 803 feet 3 inches 4 sec
onds. but several deductions
being to be made for windows.
arches. &c. these deductions
amounted to 20 feet 3 inches 7
seconds 10 thirds 5 fourths:
how many feet of work ma
nship must he be paid for.
Ans. 782 ft. 11 in. 8 1 7.

| ft | in | '' | ''' | ''' |
|-----|----|----|-----|-----|
| 803 | 3 | 4 | 0 | 0 |
| 70 | 3 | 7 | 10 | 5 |

732 11 8 1 7 Ans.

Multiplication of Decimals

Case 1

Multiply 8.69 by 7.3

$$\begin{array}{r} \text{ft. in.} \\ 8 \dots 6 \dots 9 \\ \times 7 \dots 3 \\ \hline 59 \dots 11 \dots 3 \dots 3 \\ 2 \dots 1 \dots 8 \dots 3 \\ \hline 62 \dots 0 \dots 11 \dots 3 \dots \text{Ans.} \end{array}$$

$$\begin{array}{r} 12 \overline{) 3} \\ 7.25 \\ \hline 12 \overline{) 6.75} \\ 8.5625 \\ 7.25 \\ \hline 12 \overline{) 12.5} \\ 14.1250 \\ 59.9375 \\ \hline \text{proof } 62.078125 \\ 12 \\ \hline 0.937500 \\ 12 \\ \hline 11.250000 \\ 12 \\ \hline 3.000000 \end{array}$$

2. Multiply 9.5 by 3.11

$$\begin{array}{r} \text{ft. in.} \\ 9 \dots 5 \\ \times 3 \dots 11 \\ \hline 28 \dots 5 \\ 28 \dots 3 \\ \hline 36 \dots 10 \dots 5 \dots \text{Ans.} \end{array}$$

3. Multiply 7.10 by 8.11

$$\begin{array}{r} \text{ft. in.} \\ 7 \dots 10 \\ \times 8 \dots 11 \\ \hline 56 \dots 2 \dots 2 \\ 56 \dots 8 \\ \hline 69 \dots 10 \dots 2 \dots \text{Ans.} \end{array}$$

4. Multiply 8.11 by 2.74

$$\begin{array}{r} \text{ft. in.} \\ 8 \dots 11 \\ \times 2 \dots 74 \\ \hline 2 \dots 9 \dots 6 \dots 0 \\ 16 \dots 9 \dots 0 \\ \hline 21 \dots 10 \dots 5 \dots 0 \dots \text{Ans.} \end{array}$$

5. What is the price of a marble slab, whose length is 5 feet 7 inches, and breadth 1 foot 10 inches, and ~~cost~~ at 1 doll or and 50 cents per foot

Ans. 15 dolls. 31 1/2 cts

$$\begin{array}{r} \text{ft. in.} \\ 5 \dots 7 \dots 10 \\ \times 1 \dots 10 \\ \hline 4 \dots 7 \dots 10 \\ 5 \dots 7 \\ \hline 12 \\ 12 \\ 12 \\ \hline 14.74 \\ 150 \\ 73700 \\ 1474 \\ \hline 144 \overline{) 221100} (15.35 \text{ ans.} \\ 144 \\ \hline 771 \\ 720 \\ \hline 510 \\ 480 \\ \hline 30 \\ 12 \overline{) 60} (5 \\ \hline 12 \end{array}$$

Multiplication of Decimals

6. There is a house with three tiers of windows. 3 in a tier. the height of the first tier is 7 feet 10 inches. of the second 6 feet 8 inches. and of the third 5 feet 11 inches. and the breadth of each window is 3 feet 11 inches: what will the glazing come to at six cents per foot. Ans. 32 dolls. 62½ cts.

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 7 \quad 10 \\ 6 \quad 8 \\ 5 \quad 11 \\ \hline 19 \quad 09 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 7 \quad 10 \\ 6 \quad 8 \\ 5 \quad 11 \\ \hline 19 \quad 09 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 7 \quad 10 \\ 6 \quad 8 \\ 5 \quad 11 \\ \hline 19 \quad 09 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 7 \quad 10 \\ 6 \quad 8 \\ 5 \quad 11 \\ \hline 19 \quad 09 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 7 \quad 10 \\ 6 \quad 8 \\ 5 \quad 11 \\ \hline 19 \quad 09 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 7 \quad 10 \\ 6 \quad 8 \\ 5 \quad 11 \\ \hline 19 \quad 09 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 7 \quad 10 \\ 6 \quad 8 \\ 5 \quad 11 \\ \hline 19 \quad 09 \end{array}$$

Case 2

1. Multiply 84 feet 6 inches by 36 feet 7 inches and 6 seconds.

Operation.

$$84 \text{ ft } 6 \text{ in}$$

$$6 \times 6 = 36$$

$$504 \text{ ft } 6 \text{ in}$$

$$\begin{array}{r} 6 \text{ in } 2 \text{ sec} \\ 36 \text{ ft } 7 \text{ in } 6 \text{ sec} \\ \hline 1123 \text{ ft } 7 \text{ in } 6 \text{ sec} \end{array}$$

$$\text{Ans. } 30911 \text{ ft } 9 \text{ in}$$

2 multiply 76 ft 7 in by 14 ft 10 in 15 in 10 in

$$76 \text{ ft } 7 \text{ in}$$

$$6 \times 3 + 1 = 19$$

$$1159 \text{ ft } 6 \text{ in}$$

$$1348 \text{ ft } 6 \text{ in}$$

$$\begin{array}{r} 6 \text{ in } 1 \text{ sec} \\ 14 \text{ ft } 10 \text{ in } 15 \text{ in } 10 \text{ in} \\ \hline 256 \text{ ft } 6 \text{ in } 11 \text{ in } 10 \text{ in} \end{array}$$

$$1518 \text{ ft } 10 \text{ in } 10 \text{ in}$$

3. multiply 127 ft 6 in by 11 ft 7 in 2 in 6 in

$$127 \text{ ft } 6 \text{ in}$$

$$12 \times 7 + 8 = 92$$

$$1530 \text{ ft } 0 \text{ in}$$

$$10710 \text{ ft } 0 \text{ in}$$

$$\begin{array}{r} 11 \text{ ft } 7 \text{ in } 2 \text{ in } 6 \text{ in} \\ \hline 1426 \text{ ft } 6 \text{ in} \end{array}$$

$$11772 \text{ ft } 6 \text{ in}$$

4. multiply 18 ft 4 in by 12 ft 7 in 6 in 2 in 5 in

$$18 \text{ ft } 4 \text{ in}$$

$$18 \times 4 = 72$$

$$1546 \text{ ft } 8 \text{ in}$$

$$18466 \text{ ft } 8 \text{ in}$$

$$3693 \text{ ft } 11 \text{ in}$$

$$\begin{array}{r} 6 \text{ in } 2 \text{ sec} \\ 12 \text{ ft } 7 \text{ in } 6 \text{ in } 2 \text{ in } 5 \text{ in} \\ \hline 23452 \text{ ft } 8 \text{ in} \end{array}$$

$$235450 \text{ ft } 0 \text{ in}$$

Ans

$$\begin{array}{r} 1 : 14 : : 233.0 : 6 \\ \hline 12 \\ 12 \\ 144 \\ \hline 2796 \\ 33558 \\ 134232 \\ 32558 \\ \hline 144 \quad 469812 \quad (32.62) \\ 439 \\ 378 \\ 288 \\ \hline 901 \\ 264 \\ 372 \\ 288 \\ \hline 12 \quad 84 = 7 \\ 12 \quad 144 = 12 \end{array}$$

Multiplication of Decimals.

5. multiply $311\frac{11}{16}$ ft. in. sec. by $6\frac{1}{2}$ ft. in. sec.

$$\begin{array}{r} 311\frac{11}{16} \times 6\frac{1}{2} = 1868.3.6 \\ 6 \times 6 = 36 \\ \hline 6 \text{ in. } \frac{1}{2} \mid 11209.9.0 \text{ in.} \\ 1 \text{ in. } \frac{1}{16} \mid 135.8.3.6 \\ \hline 23.9.8.4 \text{ in.} \\ 8.4.2.10.11 \\ 21.9.8.7 \\ \hline 11402.0.0.7 \text{ in.} \end{array}$$

6. A floor is 70 feet 8 inches by 38 feet 11 inches; how many square feet are therein: Ans. 2750.1.11

$$\begin{array}{r} 70 \text{ ft. } 8 \text{ in.} \times 38 \text{ ft. } 11 \text{ in.} \\ 8 \times 11 = 88 \\ \hline 52 \text{ ft. } 0 \text{ in.} \\ 25 \text{ ft. } 44 \text{ in.} \\ 1 \text{ ft. } 11 \text{ in.} \\ \hline 6 \text{ in. } \frac{1}{2} \mid 2685 \text{ in.} \\ 1 \text{ in. } \frac{1}{16} \mid 35 \text{ in.} \\ \hline 236 \text{ in.} \\ 510 \text{ in.} \\ \hline 2750.1.11 \end{array}$$

7. If a ceiling is 59 feet 9 inches long and 24 feet 6 inches broad. how many yards does it contain:

Ans. 162 yds. 5 ft. 10 1/2 in.

$$\begin{array}{r} 59 \text{ ft. } 9 \text{ in.} \times 24 \text{ ft. } 6 \text{ in.} \\ 9 \times 6 = 54 \\ \hline 358 \text{ ft. } 6 \text{ in.} \\ 1434 \text{ ft. } 0 \text{ in.} \\ \hline 1434 \text{ ft. } 0 \text{ in.} \\ 2910 \text{ ft. } 6 \text{ in.} \\ \hline 162 \text{ yds. } 5 \text{ ft. } 10 \frac{1}{2} \text{ in.} \end{array}$$

8. What will the paving of a court yard come to at 15 cents per yard. the length being 58 feet 6 inches and the breadth 54 feet 9 inches

Ans. 530 doll. 5.38 + cts.

$$\begin{array}{r} 58 \text{ ft. } 6 \text{ in.} \times 54 \text{ ft. } 9 \text{ in.} \\ 6 \times 9 = 54 \\ \hline 3134 \text{ ft. } 0 \text{ in.} \end{array}$$

$$\begin{array}{r} 58 \text{ ft. } 6 \text{ in.} \times 54 \text{ ft. } 9 \text{ in.} \\ 6 \times 9 = 54 \\ \hline 526 \text{ ft. } 6 \text{ in.} \\ 3159 \text{ ft. } 0 \text{ in.} \\ \hline 3159 \text{ ft. } 0 \text{ in.} \\ 355 \text{ yds. } 7 \text{ ft. } 10 \frac{1}{2} \text{ in.} \end{array}$$

Yards $15 : 355.7.10 \frac{1}{2}$

$$\begin{array}{r} 15 \mid 355.7.10 \frac{1}{2} \\ 10 \text{ in. } \frac{1}{2} \mid 3202 \text{ in.} \\ 12 \text{ in. } \frac{1}{16} \mid 3843 \text{ in.} \\ \hline 4686 \text{ in.} \\ 15 \text{ in.} \\ \hline 3843 \text{ in.} \\ 7686 \text{ in.} \\ \hline 11530 \text{ in.} \\ 1080 \text{ in.} \\ \hline 430 \text{ in.} \\ 648 \text{ in.} \\ \hline 822 \text{ in.} \\ 648 \text{ in.} \\ \hline 1740 \text{ in.} \\ 1728 \text{ in.} \\ \hline 12 \text{ in.} \end{array}$$

9. What is the solid content of a bale of goods. measuring in length 4 feet 6 inches. breadth 3 feet 3 inches. and depth 1 foot 10 inches. Ans. 14 ft 8 in. 330

Multiplication of Decimals

$$\begin{array}{r}
 \text{ft. in} \\
 17 \dots 6 \\
 \underline{3 \dots 3} \\
 22 \quad 6 \\
 1 \quad 10 \quad 6 \\
 \underline{24 \quad 11 \quad 6} \\
 1 \dots 10 \\
 24 \quad 11 \quad 6 \\
 \underline{20 \quad 3 \quad 9 \quad 0} \\
 11 \quad 11 \quad 8 \dots 3 \dots 0 \text{ Ans.}
 \end{array}$$

10. A merchant imports from London six bales of the following dimensions. viz. What are the solid contents and how much will the freight amount to. at 20 dollars per ton of 40 feet.
 Ans. 71 ft. 7 in. and freight 35 dolls. 79 cts.

$$\begin{array}{r}
 2 \dots 10 \\
 2 \dots 11 \\
 \underline{0 \quad 11 \quad 4} \\
 5 \quad 8 \\
 6 \quad 7 \quad 4 \dots 9 \\
 \underline{4 \quad 11 \quad 6 \quad 0} \\
 6 \quad 7 \quad 4 \\
 11 \quad 6 \quad 10 \quad 0
 \end{array}$$

$$\begin{array}{r}
 2 \dots 10 \\
 2 \dots 6 \\
 \underline{1 \quad 5 \quad 0} \\
 5 \quad 8 \\
 7 \quad 1 \quad 0 \\
 \underline{1 \dots 3} \\
 1 \quad 9 \quad 3 \quad 0 \\
 7 \quad 1 \quad 0 \\
 8 \quad 11 \quad 3 \quad 0
 \end{array}$$

$$\begin{array}{r}
 2 \dots 6 \\
 2 \dots 2 \\
 \underline{9 \quad 7 \quad 0} \\
 7 \quad 7 \quad 9 \dots 8 \\
 5 \quad 0 \quad 8 \quad 0 \\
 7 \quad 7 \quad 0 \\
 12 \quad 7 \quad 8 \quad 0
 \end{array}$$

$$\begin{array}{r}
 2 \dots 10 \\
 2 \dots 8 \\
 \underline{1 \quad 10 \quad 8} \\
 5 \quad 8 \\
 7 \quad 6 \quad 8 \dots 9 \\
 5 \quad 8 \quad 0 \quad 0 \\
 7 \quad 6 \quad 8 \quad 0 \\
 13 \quad 2 \quad 8 \quad 0
 \end{array}$$

$$\begin{array}{r}
 2 \dots 10 \\
 2 \dots 6 \\
 \underline{1 \quad 5 \quad 0} \\
 5 \quad 8 \\
 7 \quad 1 \quad 0 \\
 \underline{1 \dots 9} \\
 7 \quad 8 \quad 9 \quad 0 \\
 7 \quad 1 \quad 0 \\
 12 \quad 11 \quad 9 \quad 0
 \end{array}$$

$$\begin{array}{r}
 2 \dots 11 \\
 2 \dots 8 \\
 \underline{1 \quad 11 \quad 8} \\
 5 \quad 10 \quad 8 \\
 7 \quad 9 \quad 4 \dots 8 \\
 7 \quad 2 \quad 2 \quad 8 \\
 7 \quad 9 \quad 11 \\
 12 \dots 11 \dots 6 \dots 8 \dots 6 \\
 12 \dots 11 \dots 9 \dots 0 \dots 5 \\
 13 \dots 2 \dots 8 \dots 11 \\
 12 \dots 7 \dots 8 \dots 0 \dots 2 \\
 8 \dots 10 \dots 3 \dots 0 \dots 1 \\
 11 \dots 6 \dots 10
 \end{array}$$

$$\begin{array}{r}
 40 : 20 : 71 \dots 7 \dots 8 \dots 8 \\
 \underline{12} \\
 480 \\
 859 \\
 \underline{20} \\
 480 \quad 17180 \quad 35.79 \text{ Ans.} \\
 \underline{1440} \\
 2780 \\
 \underline{2400} \\
 3800 \\
 \underline{3360} \\
 4400 \\
 \underline{4320} \\
 80 \\
 8) 80 = 10
 \end{array}$$

Multiplication of Decimals.

Examples

1. The length of a single decked vessel is 60 feet. the breadth 20. and depth 10; what is the tonnage.

$$\begin{array}{r} 60 \\ 20 \\ \hline 1200 \\ 95 \overline{) 12000} \quad 126 \frac{6}{19} \text{ tons Ans} \\ \underline{95} \\ 250 \\ \underline{190} \\ 600 \\ \underline{570} \\ 300 \\ \underline{285} \\ 15 \end{array}$$

2. Required the tonnage of a double decked vessel whose length is 90. and breadth 30.

$$\begin{array}{r} 90 \\ 30 \\ \hline 2700 \\ 15 \\ \hline 13500 \\ 2700 \\ \hline 10800 \\ 95 \overline{) 108000} \quad 1126 \frac{6}{19} \text{ tons Ans} \\ \underline{95} \\ 1300 \\ \underline{1150} \\ 1500 \\ \underline{1425} \\ 750 \\ \underline{735} \\ 15 \end{array}$$

3. A single decked vessel is 64 feet long. 22 feet broad. and 10 feet deep: what is its tonnage.

Ans. 148 $\frac{11}{19}$ tons

$$\begin{array}{r} 64 \\ 22 \\ \hline 1408 \\ 10 \\ \hline 14080 \\ 95 \overline{) 140800} \quad 148 \frac{11}{19} \text{ tonnage Ans} \\ \underline{95} \\ 1580 \\ \underline{1425} \\ 1550 \\ \underline{1500} \\ 50 \end{array}$$

4. What will be the tonnage of a double decked vessel whose length is 80 feet. and breadth 26 feet. A. 284 $\frac{12}{19}$ tons.

$$\begin{array}{r} 80 \\ 26 \\ \hline 2080 \\ 160 \\ \hline 22400 \\ 2080 \\ \hline 20480 \\ 95 \overline{) 204800} \quad 2156 \frac{12}{19} \text{ tons Ans} \\ \underline{95} \\ 2080 \\ \underline{1900} \\ 1800 \\ \underline{1710} \\ 90 \end{array}$$

Compendium of Sliding Rule

Measuring of Boards and Timber

Examples

1. Required to find a fourth proportional to 12, 28. and 114.
Set the first term 12 on B. to the second term 28. on A. then against the third term 114 on B. stand 266 on A. which is the fourth proportional sought.

$$\begin{array}{r} 12:28::114 \\ \hline 28 \\ 912 \\ 228 \\ 12 \overline{) 3192} \quad 266 \text{ Ans.} \\ \underline{24} \\ 792 \\ \underline{72} \\ 72 \end{array}$$

2. Required the fourth proportional term to the numbers 25: 75::100. Ans. 300.

$$\begin{array}{r} 25:75::100 \\ \hline 100 \\ 25 \overline{) 7500} \quad 300 \text{ Ans.} \\ \underline{75} \\ 00 \end{array}$$

3. Required the fourth proportional term to the numbers 24:20::73

$$\begin{array}{r} 24:20::73 \text{ Ans. } 54\frac{2}{3} \\ \hline 20 \\ 24 \overline{) 460} \quad 54\frac{2}{3} \\ \underline{135} \\ 110 \\ \underline{108} \\ 2 \\ 24 \end{array}$$

Examples

1. Required the square root of 100.
Set 1 upon C to 10 upon D: then against the number 100 on C stands its root 10 on D.

2. Required the square root of 529. Ans. 23.

$$\begin{array}{r} 529(23 \text{ Ans.} \\ \hline 11 \\ 129 \\ \underline{129} \end{array}$$

3. What is the square root of 900. Ans. 30

$$\begin{array}{r} 900(30 \text{ Ans.} \\ \hline 6 \\ 500 \end{array}$$

4. What is the square root of 300. Ans. 17.3+

$$\begin{array}{r} 300(17.3+ \text{ Ans.} \\ \hline 27 \\ 200 \\ \underline{189} \\ 343 \overline{) 1100} \\ \underline{1029} \\ 71 \end{array}$$

Measuring of Boards and Timber

Section 3.

1. How many feet are there in a board that is 13 feet long and 16 inches broad.

By Duodecimals. Peccimals.

Operation.

ft in
13.0
1.4

13 0
4 4 0
17 4 0 Ans.

13.
133

39
39
13
17.29 Ans.

2. Required the superficies of a board whose mean breadth is 1 foot 2 inches and length 12 feet 6 inches.

Ans. 3 dolls. 9 $\frac{1}{2}$ cts
Ans. 14 feet 7 inches.

ft in
12.6
1.2

2 1 0
12 6
14 7 0 Ans.

3. Required the value of 5 oaken planks at 3 cents per foot; each of them being 14 $\frac{1}{2}$ feet long and their several breadths as following viz. two of 13 $\frac{1}{2}$ inches in the middle one of 14 $\frac{1}{2}$ inches in the middle and the two remaining ones each 18 inches at the broader end and 14 inches at the narrower.

Ans. 3 dolls. 9 $\frac{1}{2}$ cts

in
13 $\frac{1}{2}$
13 $\frac{1}{2}$
14 $\frac{1}{2}$
41 $\frac{1}{2}$

in
18
18
26
22 $\frac{1}{2}$
29 $\frac{1}{4}$
41 $\frac{1}{2}$
70.9"

in
11 $\frac{1}{4}$
11 $\frac{1}{4}$
22 $\frac{1}{2}$

40.9"
4x4=16
283 0
113 0 0
7 0 9
6 in 1/2 | 120 0.9
7 6 | 35.4.6
1 : 3 : 123 6.1.6
12
12
118 3 3
12
1750 0 2
3
1728) 5340 0 0 (309 Ans.
5184
156 0 6
155 5 2
54 = 1
54) 1728 = 32

Examples

1. How many inches in length will it require to make one foot of a board that is 9 inches broad. Operation. 144 : 9 = 16 inches the length required.

2. How many inches in length of a board that is 23 inches wide will make 1 foot. Ans. 6.26+ inches

23) 144 (6.26+ Ans.
135
9
116
140
138
2

Measuring Boards and Timber.

3. From a mahogany plank 16 inches broad a yard and a half (or 13 feet 6 inches) is required to be cut off: what distance from the end must the line be struck? Ans. 71.7692 inches. or 6.13 feet

$$\begin{array}{r} 13 \dots 6 \\ 12 \overline{) 26162} \quad (6.23 \text{ Ans.} \\ \underline{126} \\ 60 \\ \underline{52} \\ 80 \\ \underline{78} \\ 2 \end{array}$$

2. The quarter girt of a piece of squared timber is 15 inches. and the length is feet: required the solidity
in
15
15
Ans. 28½ feet.

$$\begin{array}{r}
 \text{in} \\
 15 \\
 \hline
 15 \\
 \hline
 45 \\
 15 \\
 \hline
 225 \\
 15 \\
 \hline
 1800 \\
 225 \\
 \hline
 11050
 \end{array}$$

$11050 \div 225 = 48 \frac{1}{3}$ feet *Ans.*

$$\begin{array}{r}
 1170 \\
 1152 \\
 \hline
 18 \overline{) 18} = 1
 \end{array}$$

5. If a piece of squared timber be
15 inches square at the greater end
and 9 inches square at the greater
end. and 9 inches square at the less
end. and the length be 20 feet: what is
the solid content: Ans. 10.13 feet.

$$\begin{array}{r} 25 \\ 2 \overline{) 50} \\ \underline{40} \\ 10 \end{array}$$

$$\begin{array}{r} 144 \\ 144 \overline{) 200} \\ \underline{144} \\ 560 \\ 112 \\ \underline{112} \\ 128 \end{array}$$

Remainder

1. If a piece of timber be 2 feet 9 inches deep, and 1 foot 4 inches broad, and the length 16 feet 9 inches. (or which is the same thing, if the quarter girt be 26 inches and the length 16 feet 9 inches) how many solid feet are contained therein:

Operations.

26 inches water girt $16.75 = 16$ feet 9 inches
 $\frac{676}{10055}$ The length

$$\begin{array}{r}
 10056 \\
 11725 \\
 \hline
 10056 \\
 1164 \overline{) 1323.00} \quad (78.63 + \text{part an.}) \\
 \underline{1005} \\
 12113 \\
 \underline{1152} \\
 910 \\
 \underline{564} \\
 460 \\
 \underline{432} \\
 28 \text{ Rem}
 \end{array}$$

W. Suppose a piece of squared timber to measure 32 by 20 inches at the greater end and 16 by 6 inches at the less. and the length 18 feet: how many feet of timber are contained therein. Ans. 34.12 + feet

Measuring Boards and Timber

$$\begin{array}{r}
 2)32 \\
 \underline{16} \\
 16 \\
 \underline{16} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 2)16 \\
 \underline{8} \\
 8 \\
 \underline{8} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 2)26 \\
 \underline{13} \\
 13 \\
 \underline{13} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 2)26 \\
 \underline{13} \\
 13 \\
 \underline{13} \\
 0
 \end{array}$$

$$\begin{array}{r}
 144)11914 \\
 \underline{1120} \\
 714 \\
 \underline{720} \\
 -6 \\
 144)11914 \\
 \underline{1120} \\
 714 \\
 \underline{720} \\
 -6
 \end{array}$$

144)11914 34.12 + feet Ans.

$$\begin{array}{r}
 14 \\
 2 \\
 2)16 \\
 \underline{11} \\
 5 \\
 2 \\
 \underline{2} \\
 0
 \end{array}$$

96 feet Ans.

3. If a piece of round timber is 18 feet long. measure 96 inches in circumference. or the quarter girt 24 inches; how many feet of timber does it contain: Ans. 42 feet.

$$\begin{array}{r}
 4)96 \\
 \underline{24} \\
 24 \\
 \underline{24} \\
 0
 \end{array}$$

$$\begin{array}{r}
 144)10368 \\
 \underline{1008} \\
 288 \\
 \underline{288} \\
 0
 \end{array}$$

72 feet Ans.

Examples

1. A piece of round timber being 4 feet 6 inches long and its mean quarter girt 12 inches: what is the content?

Decimals. 3.6 = 12 inches.

$$\begin{array}{r}
 36 \\
 \underline{190} \\
 166 \\
 \underline{1230} \\
 96 \\
 \underline{616} \\
 1103 \\
 \underline{11640}
 \end{array}$$

2. If a piece of round timber is 18 feet long. its girt at the thicker end is 14 feet. and at the smaller end 2 feet: what is its content Ans. 96 feet.

4. If a piece of round timber measure 11 feet 4 inches at the large end 2 feet 8 inches at the less. and its length 21 feet. how many feet of timber are contained therein. Ans. 64.31 feet

$$\begin{array}{r}
 11 \\
 4 \\
 2)168 \\
 \underline{112} \\
 56 \\
 \underline{56} \\
 0
 \end{array}$$

$$\begin{array}{r}
 144)9261 \\
 \underline{882} \\
 441 \\
 \underline{441} \\
 0
 \end{array}$$

64.31 feet Ans.

5. Required the amount of three pieces of round timber measuring as follows viz.

The first 24 feet long and mean girt 8 feet

the second 14 $\frac{1}{2}$ do do 3.15

the third 17 $\frac{1}{2}$ do do 6.28

Ans. 117.54 feet

$$\begin{array}{r} 178 \\ 2 \\ \hline 2 \\ 4 \end{array}$$

$$4) 3.15$$

$$\begin{array}{r} 7875 \\ 5754 \\ \hline 55125 \\ 6366 \\ 551 \\ 29 \\ \hline 62015 \\ 145 \\ \hline 310075 \\ 248066 \\ \hline 62015 \\ 5992145 \\ 42319525 \\ 96 \\ \hline 117.501700 \end{array}$$

$$4) 6.28$$

$$\begin{array}{r} 1.57 \\ 1.57 \\ \hline 1099 \\ 785 \\ \hline 157 \\ 24649 \\ 1725 \\ \hline 123245 \\ 49298 \\ \hline 172543 \\ 24649 \\ \hline 42519525 \end{array}$$

Carpenters and Joiners Work.

III Examples. III

1. If a floor be 54 feet 3 inches long and 28 feet 6 inches broad. how many squares of flooring does it contain

By decimals.

ft in

$$54 \text{ } 3 = 54.25$$

$$28 \text{ } 6 = 28.5$$

$$\begin{array}{r} 28625 \\ 45800 \\ 11450 \\ \hline 100) 1631.625 \\ 1631.625 \end{array}$$

2. Let a floor be 53 feet 6 inches long and 17 feet 9 inches broad. how many squares does it contain

Ans. 25 squares 54 feet

$$\begin{array}{r} 53.5 \\ 17.75 \\ \hline 2675 \\ 3745 \\ 3745 \\ 2140 \\ \hline 100) 2554.625 \end{array}$$

Ans.

Carpenters and Joiners Work

3. A floor being 36 feet 3 inches long and 16 feet 6 inches broad what will it cost at 4 dollars and 50 cents per square. Ans. 26 dolls. 91 cts.

$$\begin{array}{r}
 \text{ft} \\
 36.25 \\
 16.5 \\
 \hline
 18125 \\
 21750 \\
 3625 \\
 \hline
 598.125 \\
 1650 \\
 \hline
 2990.6250 \\
 2392500 \\
 \hline
 100 \overline{) 2691.56250} \text{ Ans.}
 \end{array}$$

4. A room is 35 feet long and 30 feet wide; there is in it a fire place which measures 6 feet by 11 feet 6 inches and a well hole for the stairs measures 10 feet 6 inches by 8 feet; what will the flooring come to at 3 dolls. and 75 cents per square

Ans. 35 dolls. 21 cts.

$$\begin{array}{r}
 \text{ft} \\
 35 \\
 30 \\
 \hline
 1050 \\
 1650 \\
 111 \\
 \hline
 939 \\
 373 \\
 \hline
 4693 \\
 6573 \\
 \hline
 2917 \\
 35.21.25 \text{ Ans.}
 \end{array}$$

5. How many squares are contained in a partition that is 22 feet 6 inches long and 12 feet 3 inches high
Ans. 10 squares and 10 feet.

$$\begin{array}{r}
 \text{ft} \\
 22.5 \\
 12.25 \\
 \hline
 4125 \\
 1650 \\
 \hline
 5775 \\
 525 \\
 \hline
 10.10.625 \text{ Ans.}
 \end{array}$$

6. If a partition between rooms be in length 91 feet 9 inches and its height 11 feet 3 inches; how many squares are contained in it and how much does it come to at 4 dollars and 50 cents per square. Ans. 10 squares 32 feet and costs 46 dolls. 44 cts.

$$\begin{array}{r}
 \text{ft} \\
 91.75 \\
 11.25 \\
 \hline
 455.75 \\
 18350 \\
 9175 \\
 \hline
 9175 \\
 1032.1875 \\
 450 \\
 \hline
 516093750 \\
 11287500 \\
 \hline
 6644.543750 \text{ Ans.}
 \end{array}$$

7. If a house within the walls be 22 feet 6 inches long and 18 feet 3 inches broad: how many squares of roofing will it contain allowing the roof to be the true pitch

Operation

Carpenter and Joiner's Work

By Decimals.

ft. ft in the breadth
18.25 - 18 3
44.5 - 114.6 the length
9125
7300
Flat 7300
half 812.125
half 406.62
÷ 100 1218.154
Ans. 2.18 +

ft.
40.5
20.5
2025
8100
2)83025
415125
1245375
225
6226875
2490650
2490750
28.0208375 Ans.

8. What cost the roofing of a house at 1 dollar and 40 cents per square are: the length within the walls being 52 feet 8 inches, and the breadth 30 feet 6 inches; the roof being of a true pitch. Ans. 330⁰⁰ dolls. 73 cts.

ft.
52.67
305
26335
138810
2)16064135
803217
2409652
140
96386080
2409652
33.735 1.280 Ans.

10. If a room or wainscot being 15 feet 9 inches high, and 126 feet 3 inches in compass: how many yards does that room contain? Operation.

By Decimals.

126.25
1575
63125
88375
63125
12625
9)19854375
220.8 Ans. 220 yards 8 feet

9. Suppose a house measures with in the walls 40 feet 6 inches in length, and 20 feet 6 inches in breadth, and the roof being a true pitch: how many squares of roofing does it contain, and how much will it cost at 2 dolls. 25 cents per square: Ans. 12.15375 squares, and costs 28 dolls. 2 + cts.

11. If a room of wainscot be 16 feet 3 inches high, and the compass of the room 137 feet 6 inches: how many yards are contained in it: Ans. 218 yards 2 + feet.

16.25
137.5
8125
11375
4875
1625
9)2234375
248.2 + Ans.

Carpenters and Joiners Work

12. If the window Shutters about a room be 69 feet 9 inches broad. and 6 feet 3 inches high ~~as room~~ how many yards are contained therein. at work and half. Ans. 72.656 yards.

$$\begin{array}{r}
 \text{ft} \\
 69.75 \\
 6.25 \\
 \hline
 348.75 \\
 1395.0 \\
 \hline
 4185.0 \\
 2)4185.9375 \\
 \underline{21796.875} \\
 9)6539062 \\
 \underline{72.656} + \text{Ans}
 \end{array}$$

13. What will the wainscoting of a room come to at 80 cents per square yard; supposing the height of the room including the cornice and moulding. be 12 feet 6 inches. and the compass 83 feet 8 inches. three window shutters. each 4 feet 8 inches by 2 feet 6 inches. and the door 4 feet by 2 feet 6 inches. the shutters and door being worked on both sides. are reckoned work and half.

Ans. 96 dolls. 60 $\frac{2}{3}$ cts.

$$\begin{array}{r}
 \text{ft} \quad \text{in} \\
 12 \quad 6 \\
 \hline
 23 \\
 2.5 \\
 \hline
 11.5 \\
 46 \\
 \hline
 57.5 \\
 24.5 \\
 \hline
 282.0 \\
 111
 \end{array}$$

$$\begin{array}{r}
 \text{ft} \quad \text{in} \\
 3 \quad 5 \\
 \hline
 7 \\
 24.5 \quad \text{ft} \\
 \hline
 83.666 \\
 12.5 \\
 \hline
 4183.30 \\
 1003992 \\
 \hline
 10458250 \\
 111 \\
 \hline
 10868280 \\
 9)8694.6000 \\
 \underline{96.602} \text{ Ans.}
 \end{array}$$

Decorative flourish

of Brick Layers Work.

Section 5.

1. If a wall be 42 feet 6 inches long and 19 feet 3 inches high and 5 bricks and a half thick: how many rods of brick work are contained therein when reduced to the standard thickness.

By Duodecimals. ft. in

$$\begin{array}{r}
 42 \text{ ft. } 6 \text{ in.} \\
 19 \text{ ft. } 3 \text{ in.} \\
 \hline
 145 \text{ ft. } 9 \text{ in.} \\
 72 \text{ ft. } 0 \text{ in.} \\
 \hline
 1368 \text{ ft. } 0 \text{ in.} \\
 15 \text{ ft. } 6 \text{ in.} \\
 \hline
 9 \text{ ft. } 6 \text{ in.} \\
 \hline
 \div 3) 15351 \text{ } 10 \text{ } 6 \\
 272) 5117 \text{ } (18 \text{ rods.} \\
 \underline{2397} \\
 68) 221 \text{ } (3 \text{ quarters.} \\
 \underline{17} \text{ feet.}
 \end{array}$$

3. If a wall be 245 feet 9 inches long 16 feet 6 inches high and 2 1/2 bricks thick: how many rods of brick work are contained therein when reduced to standard thickness.

Ans 24 rods 3 quarters 24 feet

$$\begin{array}{r}
 245 \text{ ft. } 9 \text{ in.} \\
 16 \text{ ft. } 6 \text{ in.} \\
 \hline
 1470 \text{ ft. } 0 \text{ in.} \\
 245 \text{ ft. } 0 \text{ in.} \\
 \hline
 3920 \text{ ft. } 0 \text{ in.} \\
 142 \text{ ft. } 10 \text{ in. } 6 \\
 \hline
 112 \text{ ft. } 0 \text{ in.} \\
 \hline
 4054 \text{ ft. } 10 \text{ in. } 6 \\
 \hline
 3) 20272 \text{ } 4 \text{ } 6 \\
 272) 6757 \text{ } (24 \text{ rods.} \\
 \underline{544} \\
 1317 \text{ } 4 \\
 \hline
 4088 \text{ } 8 \\
 \hline
 68) 229 \text{ } (3 \text{ quarters} \\
 \underline{204} \\
 25 \text{ feet}
 \end{array}$$

2. How many yards and rods of standard thickness are contained in a brick wall whose length is 57 feet 3 inches and height 24 feet 6 inches: the wall being 2 1/2 bricks thick. Ans. 259 1/4 yards or 8.58 + rods.

$$\begin{array}{r}
 57 \text{ ft. } 3 \text{ in.} \\
 24 \text{ ft. } 6 \text{ in.} \\
 \hline
 228 \text{ ft. } 0 \text{ in.} \\
 114 \text{ ft. } 0 \text{ in.} \\
 \hline
 1368 \text{ ft. } 0 \text{ in.} \\
 25 \text{ ft. } 7 \text{ in. } 6 \\
 \hline
 6 \text{ ft. } 0 \text{ in.} \\
 \hline
 1402 \text{ ft. } 7 \text{ in. } 6 \\
 \hline
 3) 7013 \text{ } 1 \text{ } 6 \\
 \underline{2337} \text{ } 8 \text{ } 8 \\
 12 \text{ } 6 \text{ } 0 \\
 \hline
 9) 233772 \\
 \underline{25974} \text{ } 2
 \end{array}$$

4. A triangle gable end is raised to the height of 15 feet above the wall of a house whose width is 45 feet and the thickness of the wall is 2 1/2 bricks: require the content in rods at standard thickness.

Ans. 24 rods 3 quarters 24 feet.

$$\begin{array}{r}
 15 \text{ ft. } 0 \text{ in.} \\
 45 \text{ ft. } 0 \text{ in.} \\
 \hline
 315 \text{ ft. } 0 \text{ in.} \\
 22 \text{ ft. } 6 \text{ in.} \\
 \hline
 337 \text{ ft. } 6 \text{ in.} \\
 \hline
 3) 1686 \text{ } 6 \\
 272) 562 \text{ } (2 \text{ rods.} \\
 \underline{544} \\
 18 \text{ feet.}
 \end{array}$$

Masons Work

Examples

1. If a wall be 94 feet 5 inches long. 18 feet 3 inches high and 2 feet 3 inches thick. how many solid feet. and perches are contained therein: By Decimals.

$$\begin{array}{r}
 94.417 \\
 1825 \\
 \hline
 1157085 \\
 1911534 \\
 \hline
 779336 \\
 94417 \\
 \hline
 177786025 \\
 225 \\
 \hline
 888930125 \\
 355572050 \\
 \hline
 355572050 \\
 \hline
 4000.1855625 \text{ Solidity.}
 \end{array}$$

2. How many solid feet. and perches. are contained in a wall 53 feet 6 inches long. 12 feet 3 inches high. and 2 feet thick: Ans. 1310.45 feet and

$$\begin{array}{r}
 52.9595 \text{ rods.} \quad \text{ft in} \\
 \text{rod in} \quad 12.25 \\
 \text{ft in} \quad 53.5 \\
 \hline
 198 \text{ inches in} \quad 6129 \\
 1536 \\
 \hline
 123564 \\
 18297 \\
 \hline
 2475 \\
 2475 \mid 1310.456 \text{ (52.9595 rods)} \\
 \hline
 12375 \\
 \hline
 7325 \\
 4950 \\
 \hline
 23750 \\
 22275 \\
 \hline
 14750 \\
 12375 \\
 \hline
 13750 \\
 12375 \\
 \hline
 1375
 \end{array}$$

3. If a wall be 104 feet 9 inches long. and 20 feet 6 inches high. how many superficial feet are contained therein: Ans. 2208 feet 10 inches.

$$\begin{array}{r}
 \text{ft in} \\
 104.9 \\
 20.6 \\
 \hline
 2140 \\
 53106 \\
 15 \\
 \hline
 2208106 \text{ Ans.}
 \end{array}$$

4. If a wall be 112 feet 3 inches long. and 16 feet 6 inches high: how many superficial rods. each 63 square feet. are contained therein: Ans. 29 rods 25 feet.

$$\begin{array}{r}
 \text{ft in} \\
 112.25 \\
 16.5 \\
 \hline
 56125 \\
 6300 \mid 1352.125 \text{ (29 rods. Ans)} \\
 126000 \\
 \hline
 92125 \\
 567000 \\
 \hline
 25125 \text{ feet}
 \end{array}$$

5. What is a marble slab worth. whose length is 5 feet 4 inches. and breadth 1 foot 10 inches. at 80 cents per foot superficial: Ans. 3 dolls. 19 cts.

$$\begin{array}{r}
 \text{ft in} \\
 5.4 \\
 1.10 \\
 \hline
 5.4 \\
 1.10 \\
 \hline
 1:80::10:2.10 \\
 12 \\
 122 \\
 12 \\
 \hline
 144 \mid 1474 \\
 80 \\
 \hline
 144 \mid 17920 \text{ (107 cts. Ans)} \\
 1152 \\
 \hline
 272 \\
 144 \\
 \hline
 1280 \\
 1152 \\
 \hline
 128
 \end{array}$$

5. The length of a room is 14 feet 5 inches. breadth 12 feet 2 inches. and high 9 feet 3 inches. to the under side of the cornice. with projection 5 inches from the wall on the upper part next the ceiling: required the quantity of rendering and plastering: there being no deductions but pour a door the size whereof is 7 by 4 feet: Ans. 53 yds. 5 feet. of rendering. and 18 yds. 5 feet. ceiling

$$\begin{array}{r}
 \text{ft in} \\
 14 \text{ } 5 \\
 12 \text{ } 2 \\
 \hline
 28 \text{ } 10 \\
 26 \text{ } 4 \\
 \hline
 55 \text{ } 2 \\
 9 \text{ } 3 \\
 \hline
 49 \text{ } 5 \\
 13 \text{ } 9 \text{ } 6 \\
 1 \text{ } 6 \\
 \hline
 51 \text{ } 0 \text{ } 3 \text{ } 6 \\
 28 \\
 \hline
 9) 482 \text{ } 3 \text{ } 6 \\
 53 \text{ } 5 \text{ } \text{Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{ft in} \\
 13 \text{ } 7 \\
 12 \text{ } 11 \\
 \hline
 26 \text{ } 11 \\
 17 \\
 11 \\
 \hline
 25
 \end{array}$$

$$\begin{array}{r}
 \text{ft in} \\
 13 \text{ } 7 \\
 12 \text{ } 11 \\
 \hline
 156 \\
 14 \text{ } 6 \text{ } 4 \\
 7 \\
 \hline
 9) 167 \text{ } 6 \text{ } 4 \\
 18 \text{ } 5 \text{ } \text{Ans.}
 \end{array}$$

6. If a circular vaulted roof of a church measures 105 feet 6 inches in the arch and 775 feet 5 inches in length what will the plastering come to at 12 cents per yard: Ans. 387 dollars. 42 cts.

$$\begin{array}{r}
 \text{ft in} \\
 275 \text{ } 5 \\
 105 \text{ } 6 \\
 \hline
 1375 \text{ } 30 \\
 2750 \\
 1375 \text{ } 30 \\
 \hline
 1375 \text{ } 30 \\
 1375 \text{ } 30 \\
 \hline
 2750 \\
 1375 \text{ } 30 \\
 \hline
 4125 \text{ } 60 \\
 4125 \text{ } 60 \\
 \hline
 8251 \text{ } 20 \\
 1296 \text{ } 00 \\
 \hline
 1296 \text{ } 00 \\
 3858 \\
 \hline
 11329 \\
 10368 \\
 \hline
 9615 \\
 9072 \\
 \hline
 5436 \\
 5184 \\
 \hline
 2520 \\
 2592
 \end{array}$$

7. What will the white washing of a room come to at 2 cents per yard. allowing it to be 30 feet 6 inches long 24 feet 9 inches broad. and 10 feet high: no deductions being made for vacuities: Ans. 140 dollars. 13 1/2 cts.

$$\begin{array}{r}
 30 \text{ } 6 \\
 24 \text{ } 9 \\
 \hline
 61 \text{ } 0 \\
 110 \text{ } 50 \text{ } 0 \\
 110 \text{ } 50 \text{ } 0 \\
 \hline
 754875 \\
 9:2::1859875 \\
 9.000) 3419.450 \\
 6000 \\
 \hline
 119750 \\
 90000 \\
 \hline
 297500 \\
 270000 \\
 \hline
 275000 \\
 275000 \\
 \hline
 500
 \end{array}$$

Paver's Work

Section 8.

1. What cost the paving of a street 225 feet 6 inches long and 60 feet 6 inches wide at 30 cents per square yard By Duodecimals.

$$\begin{array}{r}
 \text{ft in} \\
 225.6 \\
 60.6 \\
 \hline
 13509 \\
 112.9 \\
 \hline
 30.9 \\
 \div 9) 13612.9 \\
 \underline{1515.7.9} \\
 1154.50 \\
 26 = \text{the piece of } 4 \text{ ft } 9 \text{ inches}
 \end{array}$$

2. What will the paving of a foot path come to at 28 cents per yard the length being 35 feet 4 inches and the breadth 8 feet 3 inches. Ans 9 dolls. 40 cts.

$$\begin{array}{r}
 \text{ft in} \\
 35.4 \\
 8.3 \\
 \hline
 280 \\
 8100 \\
 \hline
 9:28::29160 \\
 12 \\
 108 \quad 3498 \\
 \hline
 27284 \\
 6996 \\
 \hline
 108) 97944 \quad (906 + \text{Ans.} \\
 \underline{972} \\
 744 \\
 \underline{648} \\
 96
 \end{array}$$

3. What cost the paving of a court yard at 38 cents per yard the length being 24 feet 10 inches and the breadth 14 feet 9 inches:

Ans. 17 dolls. 33 1/2 cts

$$\begin{array}{r}
 27.10 \\
 14.9 \\
 \hline
 598 \\
 20106 \\
 1186 \\
 \hline
 9:38::41266 \\
 12 \\
 108 \quad 4926 \\
 \hline
 1296 \quad 59118 \\
 \hline
 442944 \\
 147354 \\
 \hline
 1296) 2246484 \quad (1733.34 \text{ Ans.} \\
 \underline{1296} \\
 9504 \\
 9042 \\
 \hline
 4328 \\
 3888 \\
 \hline
 4404 \\
 3888 \\
 \hline
 5140 \\
 3888 \\
 \hline
 1252
 \end{array}$$

11. What will be the expense of having a rectangular yard whose length is 63 feet and breadth 45 feet in which there is a foot path 2 feet 3 inches broad running the whole length with broad stones at 36 cents a yard the rest being paved with pebbles at 20 cents a yard: Ans 96 dolls. 07 1/2 cts.

$$\begin{array}{r}
 63 \\
 45 \\
 \hline
 315 \\
 252 \\
 \hline
 253500 \\
 230.75 \\
 \hline
 9:30::230425 \\
 900) 7512750 \quad (8347.5 \\
 \underline{7200} \\
 3125 \\
 2400 \\
 \hline
 4275 \\
 6300 \\
 \hline
 6300 \\
 4500 \\
 \hline
 1525 \\
 62 \\
 \hline
 3150 \\
 9:36::330.75 \\
 198450 \\
 99225 \\
 \hline
 900) 1190700 \quad (1323 \\
 \underline{900} \\
 2907 \\
 2700 \\
 \hline
 2070 \\
 1800 \\
 \hline
 2700 \\
 2400 \\
 \hline
 300
 \end{array}$$

Painters Work

Section 9. 1. How many yards of painting will a room contain which (being girt over the mould dings) is 16 feet 6 inches. and the compass of the room 44 feet 6 inches:

By Decimals.

ft. in
44 6 = 44.5
16 6 = 16.5

44.5
5950
275

9) 1608.75 feet

yards 178.6.75

2. A gentleman had a room painted at 8 1/2 cents per yard. the measure whereof is as follows. viz. the height 11 feet 7 inches. the compass 44 feet 10 inches. the door 7 feet 6 inches by 3 feet 9 inches: five window shutters. each 6 feet 8 inches by 3 feet 4 inches: the breaks in the windows 14 inches deep. and 8 feet high: the opening for the chimney 6 feet 9 inches by 5 feet. to be deducted. the shutters and door are painted on both sides: what will the whole come to: Ans. 10 dolls. 43 cts.

7.6
3.9
21
5 7.6
7 6
28-1-6
ft
69
5
33.9

ft in
44-10
11-7
74
74 3-7-10
9-2
866 9-10
111 1 4
28 1 6
46 8 8
1052 8 8
33 9 8
9) 1018 11 8
113 1-11-8
8 1/2
9045
565
9.60.5 Ans

8 1/2 3-4
16.8 2
6.8
2.11
18-2-8
2-2-8
22-2-8
111-1-4
132-2-8 breaks
9-4
46-8 breaks

3. How many yards of painting are there in a room. the length where of is 20 feet. its breadth 11 feet 6 inches. and height 10 feet 4 inches: deducting a fire place of 4 feet by 4 feet 11 inches. and two windows. each 6 feet by 3 feet 2 inches: Ans. 73 2/3 yards.

20
2
40
11-6
29-0
46
69 0
10 4
690
23
713
55-11
9) 654-8
12
108 73-8 2/3
7108-27 Ans

ft in
11-6
10-4
17-4
8-2
6
19-0
2
38-0
17-4
55-4

11. What cost the painting of a room at 6 cents per yare: its length being 24 feet 6 inches. its breadth 16 feet 3 inches. and height 12 feet 9 inches; also the door is 7 feet by 3 feet 6 inches. and the window shutters of two windows. each 7 feet 9 inches by 3 feet 6 inches. but the breaks of the windows themselves. are 3 feet 6 inches high and 1 foot 3 inches deep: deducting a piece - place of 5 feet by 5 feet 6 inches: Ans. 4 dolls. 41 + cts.

| | | | | | | |
|------|------|---------|-------|---------|------------|---------------|
| 16.3 | 24.5 | Length | 7.0 | Door | 7.9 | 8.6 |
| 16.3 | 24.5 | breadth | 21.0 | Windows | 23.3 | 1.3 |
| 32.6 | 32.6 | compass | 3.6 | Breaks | 3.10.6 | 3.6.6 |
| | 81 | 12 9 | 21.6 | | 27.1.6 | 2.1.6 |
| | | | 5.4.3 | | 54.3.0 win | 10.7.6 |
| | | | 21.3 | | | 21.3.0 Breaks |
| | 948 | 0 | 100.0 | | | pt in |
| | 61 | 1.6 | | | | 5 6 |
| | 1039 | 1.6 | | | | 27.6 Chimney |
| | 100 | 0.0 | | | | |
| | 1139 | 1.6 | | | | |
| | 24 | 6 | | | | |
| | 971 | 1.1 | | | | |
| | 123 | 11.7.6 | | | | |
| | 108 | 4.3 | | | | |
| | 1296 | 4.41 | | | | |
| | | Ans. | | | | |
| | | 1296 | | | | |
| | | 3096 | | | | |
| | | 3888 | | | | |
| | | 103 | | | | |

Glaziers Work

Section 10. 1. How many square feet are contained in a window which is 16 feet 3 inches long. and 2 feet 9 inches broad.

Ans. 47 yd. 3 ft. 3 in.

2. If a window be 14 feet 2 inches high. and 3 feet 5 inches broad. how many square feet of glazing are contained therein: Ans. 24 feet 9 inches.

Ans.

B

3. There is a house with three tiers of windows. 7 in a tier. the height of the first tier is 8 feet 11 inches. of the second. 5 feet 4 inches. and the third. 11 feet 3 inches: the length of each window is 3 feet 6 inches: what will the glazing come to at 14½ cents per foot: Ans. 53 dolls. 61 cts.

$$\begin{array}{r} 6 \dots 11 \\ 5 \dots 4 \\ 11 \dots 3 \\ \hline 16 \dots 6 \end{array}$$

$$\begin{array}{r} 3 \dots 6 \\ 2 \dots 4 \\ 1 \dots 6 \\ \hline 14 \dots 4 \end{array}$$

| | | |
|---------|---------|-------|
| 4.3 | 6.11 | 5.4 |
| 29.9 | 48.5 | 24.4 |
| 3.6 | 5.6 | 3.6 |
| 14.40.6 | 24.2.6 | 18.8 |
| 89.3 | 145.3 | 112.0 |
| 104.1.6 | 167.5.6 | 130.8 |
| | 104.1.6 | |
| | 130.8.0 | |

$$\frac{1}{12} : 11\frac{1}{2} :: 110\frac{1}{4} : 118\frac{5}{8}$$

$$\begin{array}{r} 12.0 \overline{) 1403.3} \\ 6 \overline{) 701.65} \\ 10 \overline{) 7016.5} \\ 19 \overline{) 70165} \\ 42 \overline{) 701650} \\ 1 \overline{) 7016505} \end{array} \quad \begin{array}{r} 19 \dots 11 \dots 0 \dots 4 \\ 11 \dots 8 \dots 5 \dots 1 \\ 11 \dots 8 \dots 5 \dots 1 \end{array} \quad \begin{array}{r} 118 \dots 5 \dots 1 \\ 111 \dots 2 \end{array}$$

(58.61 Ans)

What will the glazing of a triangular sash light come to at 10 cents per foot. the base being 12 feet 6 inches long and the perpendicular height 16 feet 9 inches: Ans. 10 dolls. 46½ cts.

$$\begin{array}{r} 12 \dots 6 \\ 8 \dots 11 \dots 6 \end{array}$$

$$\begin{array}{r} 100 \dots 0 \\ 4 \dots 2 \\ 6 \dots 3 \end{array}$$

$$\begin{array}{r} 11:10::104 \dots 8 \dots 3 \\ 12 \overline{) 1256} \\ 104 \overline{) 15075} \\ 111 \overline{) 150750} \\ 678 \overline{) 150750} \\ 578 \overline{) 150750} \\ 860 \overline{) 150750} \\ 6 \overline{) 150750} \end{array} \quad \begin{array}{r} 10 \dots 11 \dots 6 \dots 7 \\ 21 \dots 7 \\ 24 \dots 8 \end{array}$$

(10.116½ Ans)

5. What is the area of an elliptical fan light of 14 feet 6 inches in length. and 9 feet 9 inches in breadth: Ans. 63 feet 10 inches

$$\begin{array}{r} 14 \dots 6 \\ 11 \dots 9 \\ 58 \dots 0 \\ 10 \dots 10 \dots 6 \\ 68 \dots 10 \dots 6 \end{array} \quad \text{Ans.}$$

6. There is a house with three tiers of windows. and 9 in each tier: the height of the first tier is 4 feet 10 inches. of the second. 6 feet 8 inches. of the third. 5 feet 11 inches: what will the glazing come to at 14 cents per foot: Ans. 97 dolls. 87½ cts.

Praper

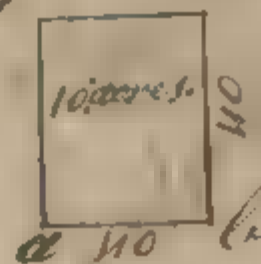
204

SS Section 11. SSSSS 1. In the square of a field. A. B. C. D.

Operation.

$$\begin{array}{r} 40 \\ 40 \\ 40 \overline{) 1600} \\ \underline{40} \\ 120 \\ \underline{40} \\ 80 \\ \underline{40} \\ 40 \end{array}$$

Acris. Ans.



35

$$\begin{array}{r} 2 \\ 790 \\ \hline 14054900 \\ 4) 122-20 \\ \underline{30-2-} \end{array}$$

$$\begin{array}{r} 1) 122-20 \\ \underline{30-2-20} \end{array} \text{ Ans.}$$

Examples.

1. There is an oblong square piece of ground. A. B. C. D. the longest sides of which measure 64 perches, and the shortest sides or ends, measure 40: how many acres does it contain.

Operation.

64 = the length
40 = the breadth

492560
44.64

16 Acres. Ans.

3. A piece of square ground measures 16 $\frac{1}{2}$ perches on each side: what is the content in acres. Ans. 1 acre 2 roods 20 $\frac{1}{2}$ p.

$\begin{array}{r} 16.5 \\ \times 16.5 \\ \hline 825 \\ 1650 \\ \hline 272.25 \end{array}$

$16\cancel{.}272.25$ (1 acre
60)

$40\cancel{)}112$ (2 rods.
80)

$32\frac{1}{4}$

16272.25 (1 acre)

10/12 (2 rods.)

$$\frac{32 \frac{1}{4}}{00}$$

2. In a piece of ground lying in the form of an oblong square. the length measures 120 perches and the breadth 84. what is its content in acres.

$$\begin{array}{r} 120 \\ 84 \\ \hline 960 \\ 10080 \\ \hline 10080 \end{array} \quad \text{Ans. 63 acres.}$$

3. A lot of ground lying in the form of an oblong square. measure 120 feet in length and 120 in breadth: what is its content in acres: Ans. 0 acres 2 quarters 25 perches 213 1/4 feet.

$$\begin{array}{r} 120 \\ 120 \\ \hline 14400 \\ 1089 \\ \hline 115200 \end{array} \quad \text{(105 perches)}$$

4. There is an oblong piece of ground whose length is 14 two pole chains 25 links and breadth 8 chains 37 links: how many acres does it contain:

$$\begin{array}{r} 8.37 = 17.118 \text{ breadth} \\ 14.25 = 29 \text{ length} \\ \hline 157.32 \\ 3496 \\ \hline 4.0 \overline{) 50.692} \\ 4 \overline{) 12.26} \\ \hline 3.0.26.92 \end{array}$$

Ans. 3 acres 0 quarters 27 perches

5. An oblong piece of ground measures 17 two pole chains and 21 links in length and 15 chains 38 links in breadth: how many acres are contained therein:

$$\begin{array}{r} 17.21 \\ 2 \overline{) 34.84} \\ \hline 34.84 \end{array} \quad \begin{array}{r} 15.38 \\ 2 \overline{) 31.52} \\ \hline 31.52 \end{array}$$

$$\begin{array}{r} 34.84 \\ 31.52 \\ \hline 69.68 \\ 17420 \\ 3484 \\ \hline 10452 \end{array}$$

$$\begin{array}{r} 160000 \overline{) 1098.1568} \\ 9600000 \\ \hline 40138.1568 \\ 3218 \end{array} \quad \text{(6 acres)}$$

Rule. SSSSSSS

1. Let A.B.C. be a triangular piece of ground. the longest side or base B.C. is 24 chains 38 links and perpendicular A.D. 13 chains 28 links: how many acres does it contain

Operation.

$$\begin{array}{r} \text{ch. } 24.38 = 49.52 \text{ perches} \\ 13.28 = 27.12 \\ \hline 9904 \\ 4952 \\ \hline 34664 \\ 9904 \\ \hline 9824 \\ 1342 \end{array}$$

$$\begin{array}{r} 67.1.4912 \text{ perches} \\ 16.31 \\ \hline 11031.4 \end{array}$$

Ans. 11 acres 0 quarters 31.1 perches

2. In a triangular piece of ground the base or longest side measures 45 perches. and the perpendicular 50: how many acres does it contain

Ans. 11 acres 2 qrs. 35 perches.

$$\begin{array}{r} 75 \\ 50 \\ 273750 \\ 40 \overline{) 1875} \\ 4) 46 = 35 \end{array}$$

11 = 2 = 35 Ans.

1. Let A. B. C. D. be a piece of ground in the forme of an oblique parallelogram. the base of which. A. B. measures 44 perches. and the perpendicular. D. E. 40 perches. how many acres does it contain:

$$\begin{array}{r} 44 \text{ length} \\ 40 \text{ breadth} \\ 40 \overline{) 1760} \\ 4) 44 \end{array}$$

11 acres. Ans.

3. How many superficial yards are contained in a triangular piece of ground. the base of which measures 120 perches. and the perpendicular 84 perches: Ans. 1417 dolls. 50cts.

$$\begin{array}{r} 84 \\ 120 \\ 1680 \\ 84 \\ 2) 10080 \\ 40 \overline{) 5040} \\ 4) 126 \\ 4) 31 = 2 \\ 126 \\ 45 \\ 630 \\ 504 \\ 4) 5640 \\ 1417.50 \end{array}$$

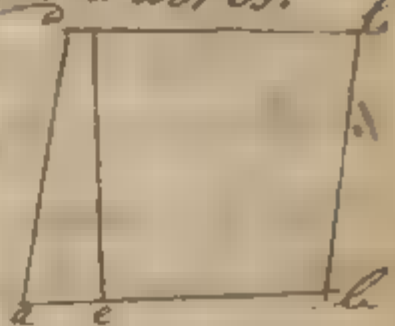
Ans.

2. A piece of ground lying in the form of an oblique parallelogram. is found to measure 80 perches along its base. and its perpendicular or height 24 perches. how many acres does it contain.

$$\begin{array}{r} 80 \\ 24 \\ 320 \\ 160 \\ 40 \overline{) 1920} \\ 4) 48 \end{array}$$

12 Ans.

Ans. 12 acres.



Example.



1. Let A. B. C. D. be a field with four irregular and unequal sides. the diagonal line of which. A. C. measures 80 perches. the perpendicular. B. m. measures 25 perches. and the other perpendicular. D. n. 35 perches: how many acres does it contain:

11. How many superficial yards are contained in a triangular piece of ground. the base of which measures 140 feet. and the perpendicular 70 feet: Ans. 544 yards 11 feet.

$$\begin{array}{r} 140 \\ 70 \\ 29800 \\ 9) 4900 \\ 544 = 11 \end{array}$$

Ans.

Example.

Operation: ^{onal line}
 80 the length of the diag
 $25+35=60$ the sum of the two perpen
 diculars.
 $2) 4800$
 $110) 2400$ perches.
 $2) 60$
 15 acres. Ans.

2. In a field of four unequal sides.
 the diagonal line between the two m
 ost distant corners. measures 120 rods.
 and the perpendiculars measures. the
 one 48. and the other 24 rods: requires
 the number of acres it contains:

48
 24
 72
 120
 72
 240
 840
 $2) 8640$
 $110) 11320$
 $110) 108$
 24 Ans.

))) Examples)))

1. How many acres are contained in a
 circular piece of ground whose dia
 meter measures 320 perches. or one
 mile $320 \times 320 = 102400$

102400
 7854
 119600
 512000
 819200
 716800
 $110) 801124.9600$
 $110) 2010.24.9$
 $502.2.21.9$

Ans. 502 acres 2 qrs. 21.9 perches.

2. If gentleman has an ellip
 tical yard in front of his
 house. the longest diameter of
 which measures 30 perches. and
 the shortest 20. how much ground
 is contained herein

Ans. 2 acres 3 qrs. 31.2 perches.

7854
 600
 $110) 471.2400$
 $110) 11.31.24$
 $2.33.31.24$ Ans.

3. How many square yards are
 contained in a circular piece of
 ground. the diameter of which
 measures 160 feet:

Ans. 2234 + yards.

160
 160
 9600
 160
 25600
 7854
 102400
 128000
 204800
 149200
 $9) 2010624.00$
 $2234 +$ Ans.

Gauging. Sam

Section 12

1. How many gallons of wine will a cask contain whose bung diameter is 31 inches. head diameter 25 inches. and whose length is 3 feet. or 36 inches:

$$\begin{array}{r} 31 \text{ bung diam.} \quad 25 \\ 25 \text{ head diam.} \quad 1 \text{ of } 6 \quad 11 \\ 6 \text{ difference.} \quad 3 \quad 19 \\ \hline 29 \end{array}$$

$$261$$

$$511$$

$$36$$

$$5616$$

$$2523$$

$$30276 \text{ cubic inches.}$$

square of the mean diam
the length

$$30276 \div 2911 = 102 \frac{288}{2911} \text{ gals. or } 102 \text{ gals. } 39 \text{ pt. } 1 \frac{22}{38} \text{ pt.}$$

2. The diameter of a barrel at the bung measures 24 inches. and at the head 18 inches. and its length is 24 inches; what is its content in wine measure? Ans. $39 \frac{25}{119}$ gals.

$$\begin{array}{r} 24 \\ 18 \\ \hline 6 \end{array}$$

$$3 \text{ of } 6 = 11$$

$$18$$

$$22$$

$$44$$

$$44$$

$$1811$$

$$211$$

$$1986$$

$$468$$

$$2911 \overline{) 11616}$$

$$882$$

$$4496$$

$$26116$$

$$1506$$

$$6 \overline{) 294} = 49$$

$$39 \frac{25}{119} \text{ gals.}$$

Mechanical Powers

Section. 13

1. If a man weighing 150 lb. rest on the end of a lever 12 feet long: what weight will he balance on the other end. supposing the prop $1\frac{1}{2}$ foot from the weight.

12 = the length of the lever
1.5 = distance of the weight from the prop

10.5 = the distance from the prop to the man

Then as 1.5 : 10.5 :: 150 : 105. Ans.

2. The head of a pair of steel yards weighing 5 lb. is removed 20 inches back from the fulcrum: what weight will it balance suspended at 1 inch distance on the opposite side: Ans. 100 lb.

in in lb
1 : 20 :: 5 : 100
100 Ans.

1. It is required to make a windlass be equal to 12 lb. suspended to the axle: now allowing the axle to be 14 inches diameter: what must be the diameter of the wheel:

as 14 : 12 :: 118 = 11 feet the diam. of the wheel. Ans.

2. Suppose the diameter of an axle to be 6 inches. and the at of the wheel 5 feet: what power at the wheel will balance 10 lb. at the axle: Ans. 1 lb.

ft lb in
5 : 10 :: 6 : 1
60) 60 1 lb Answer

Examples.

There is a screw whose threads are $\frac{1}{4}$ inch asunder: the lever by which it is turned is 36 inches long. and the weight to be raised a ton. or 2240 lb.: what power or force must be applied to the end of the lever sufficient to turn the screw that is to raise this weight.

Thus. the lever $36 \times 2 = 72$. and $72 \times 3.14159 = 228.191$ the circumference.

circum. in. lb. lb.
Then as 228.191 : 1 :: 2240 : 10266 the power

[Faint decorative flourishes and scribbles at the bottom of the page.]

James Promiscuous

Promiscuous Questions

Examples.

1. What is the sum of 2578. added to itself: Ans. 5156.

$$\begin{array}{r} 2578 \\ 2578 \\ \hline 5156 \end{array} \text{ Ans.}$$

5. What number is that which being multiplied by 115. the product will be 1080: Ans. 24.

$$\begin{array}{r} 115 \overline{) 1080} \\ \underline{90} \\ 180 \\ \underline{180} \\ 0 \end{array} \text{ Ans. 24}$$

2. What is the difference between 11676. and the fourth of it self: Ans. 11007.

$$\begin{array}{r} 11676 \\ 3669 \\ \hline 11007 \end{array} \text{ Ans.}$$

6. Required the quotient of the square of 1176. divided by the half of its roots: Ans. 952.

$$\begin{array}{r} 1176 \\ 1176 \\ \hline 2352 \\ 3332 \\ \hline 1900 \\ 226576 \end{array} \begin{array}{r} 2 \\ 238 \\ \hline 952 \end{array} \text{ Ans.}$$

3. There is the sum of 1168 dollars in three bags: the first contains 161. the second 581. how many are in the third bag: Ans. 426.

$$\begin{array}{r} 1168 \\ 581 \\ \hline 426 \end{array} \text{ Ans.}$$

4. What is the sum of the three and half third of 1 dollar: Ans. 50 cts.

$$\begin{array}{r} 3100 \\ 233\frac{1}{3} \\ \hline 50 \end{array}$$

7. A general drawing up his army into a solid square. found he had 231 over and above. but increasing each side with one soldier, he wanted 11 to complete the square: how many men did his army consist of: Ans. 19000.

$$\begin{array}{r} 231 \\ 111 \\ \hline 275 \\ 2711 \\ \hline 137 \\ 137 \\ \hline 959 \\ 411 \\ \hline 134 \\ 18769 \\ 231 \\ \hline 19000 \end{array} \text{ Ans}$$

8. What number added to the cube of 21. will make the sum equal to 173 times 1118? Ans. 1350.

$$\begin{array}{r} 21 \\ 21 \\ 21 \\ 42 \\ 441 \\ 21 \\ 441 \\ 882 \\ \hline 9261 \end{array}$$

$$\begin{array}{r} 1118 \\ 1118 \\ 1118 \\ 1118 \\ 1118 \\ 1118 \\ 1118 \\ 1118 \\ 1118 \\ 1118 \\ \hline 1350 \end{array}$$

Ans.

9. A person possessed of $\frac{3}{4}$ of a ship. sold $\frac{2}{3}$ of his share for 1260 dollars: what was the value of the whole ship at the same rate? Ans. 5040 dollars.

$$\frac{2}{3} \times \frac{3}{4} = \frac{1}{2} = \frac{1}{2}$$

$$\frac{1}{2} : 1260 :: 1 : 2520$$

10. A guardian paid his ward 3500 dollars for 2500 dollars. which he had in his hands for 8 years: what rate of interest did he allow him? Ans. 5 per cent.

$$\begin{array}{r} 3500 \\ 2500 \\ \hline 1000 \end{array}$$

$$2500 : 1000 :: 100 : 40$$

11. A young man received 210 dolls. which was $\frac{1}{3}$ of his elder brother's portion: now three times the elder brother's portion was half of the father's estate: how much was the estate worth? Ans. 1890.

14. A. B. and C. entered into partnership in trade. A put in a sum unknown. B put in 20 pieces of cloth. and C put in 50 dollars: at the end of one year they had gained 1000 dolls. whereof A received 350 dollars for his share, and B 400 dolls. required C's share. how much A put in, and the value of B's cloth? Ans. C's share 250 dolls. - A put in 700 dolls. - B's cloth was worth 800 dolls.

$$\begin{array}{r} 210 \\ 3 \\ \hline 2130 \\ 315 \\ \hline 945 \\ 1890 \end{array}$$

Ans.

12. A broker bought for his principal in the year 1720, the sum of 100 dollars capital stock. in the south sea. at 650 per cent. and sold it again when it was worth but 130 dollars per cent: how much was lost in the whole? Ans. 2080 dollars

$$\begin{array}{r} 100 : 650 :: 100 : 650 \\ 100 : 130 :: 100 : 130 \\ \hline 260000 \\ 52000 \\ \hline 208000 \end{array}$$

Ans.

13. A gentleman went to sea at 14 years of age: 8 years after he had a son born. who lived 116 years. and died before his father: after whom the father lived twice 20 years. and then died: demand the age of the father when he died? Ans. 111 years

$$\begin{array}{r} 14 \\ 8 \\ 116 \\ 40 \\ \hline 178 \end{array}$$

Ans.

$$\begin{array}{r} 1000 \\ 750 \\ \hline 250 \end{array}$$

$$\begin{array}{r} 350 \\ 100 \\ \hline 750 \end{array}$$

$$250:500::350$$

$$250 \overline{) 175000} \begin{array}{l} 700 \text{ Ans} \\ 175000 \\ \hline 00 \end{array}$$

$$250:500::400$$

$$250 \overline{) 200000} \begin{array}{l} 800 \text{ B} \\ 200000 \\ \hline 00 \end{array}$$

15. A captain and 160 sailors took a prize worth 2720 dolls. of which the captain gets $\frac{1}{5}$ part and the rest is equally divided among the sailors: what was each one's part: Ans. the captain gets 544 dolls. and each sailor 13 dollars. 60 cts.

$$\begin{array}{r} 2720 \\ 5111 \text{ Captain} \\ 160 \overline{) 2176} \begin{array}{l} 13.60 \text{ Each sailor} \\ 1600 \\ \hline 576 \\ 1180 \\ \hline 960 \end{array} \end{array}$$

16. A lady tells her husband. upon their marriage. that her fortune. the interest of which for one year. at 6 per cent. was 972 dollars. was but the $\frac{2}{3}$ of the interest of her fathers estate for three years. at the same rate per cent: what was the lady's fortune. and what was the value of her fathers estate: Ans. Her fortune was 16200 dollars. and her fathers estate was 150000 dollars.

$$6:100::972$$

$$\begin{array}{r} 100 \\ 6 \overline{) 97200} \\ 16200 \text{ the Ladies fortune.} \end{array}$$

$$6:100::9000$$

$$\begin{array}{r} 100 \\ 6 \overline{) 900000} \\ 150000 \text{ the Fathers fortune} \end{array}$$

17. A stone measures 11 feet 6 inches long. 2 feet 9 inches. broad. and 3 feet 11 inches deep: how many cubic feet does it contain: Ans. 11 feet 3 inches.

$$\begin{array}{r} \text{ft in} \\ 11 \text{ ft } 6 \text{ in} \\ 2 \text{ ft } 9 \text{ in} \\ 3 \text{ ft } 11 \text{ in} \\ \hline 11 \text{ ft } 3 \text{ in} \end{array}$$

Ans.

18. Suppose $\frac{1}{3}$ of a mast or pole stands in the ground. 12 feet in the water. and $\frac{5}{8}$ of its length above the water: what is its whole length? Ans. 216 feet.

$$\begin{array}{r} 3 \overline{) 9 \frac{5}{8}} \\ \underline{3} \\ 6 \\ \underline{6} \\ 0 \end{array}$$

from 1
Take $\frac{17}{18}$
 $\frac{1}{18}$

1:12 :: 18
 $\frac{12}{18}$ Ans.

19. A gentleman being asked his age. answered. ~~my~~ my grand father is 112 years old. and my father is $\frac{4}{7}$ of his age. whilst mine is but $\frac{1}{5}$ of my father's: what was his age? Ans. 21 $\frac{1}{2}$ years.

$$\begin{array}{r} 112 \\ 7 \overline{) 448} \\ \underline{64} \end{array}$$

376 $\frac{1}{2}$ years Ans.

20. A person who was possessed of $\frac{2}{5}$ share of a copper mine. sold $\frac{2}{11}$ of his interest therein for 1710 dollars; what was the value of the property at the same rate? Ans. 3800 dolls.

$$\frac{\frac{2}{5} \times \frac{9}{11} = \frac{9}{20}}$$

$\frac{2}{20} : 1710 :: \frac{1}{1} = 34200$
9) 34200 (3800 Ans.

21. There are two numbers. the one 63. the other half as much: required the product of their squares. and the difference of their product and sum:

Ans. { Product of the squares 3938240.25.
(Difference 1890.

$$\begin{array}{r} 2 \overline{) 63} \\ \underline{31.5} \\ 94.5 \end{array}$$

$$\begin{array}{r} 31.5 \\ \underline{63} \\ 94.5 \end{array}$$

$$1890$$

$$1984.5$$

$$94.5$$

$$1890.0$$

Difference

$$\begin{array}{r} 63 \\ \underline{63} \\ 378 \\ \underline{378} \\ 3969 \end{array}$$

$$\begin{array}{r} 2 \overline{) 63} \\ \underline{31.5} \\ 94.5 \\ \underline{94.5} \\ 0 \end{array}$$

$$893025$$

$$595350$$

$$893025$$

$$297675$$

$$3938240.25$$

ct
produ

22. Two men set out at the same time from the same place, but go contrary ways, and each of them travel 34 miles a day; required the time in which they will have travelled 2000 miles? Ans. 29 days 9 hours $52\frac{64}{68}$ minutes.

$\frac{24}{24}$
 $68:1::2000$
 $(8) 2000 (29 \text{ Days.})$

$$\begin{array}{r}
 640 \\
 812 \\
 \hline
 28 \\
 211 \\
 \hline
 112 \\
 56 \\
 \hline
 65 \overline{) 672} 9 \text{ Hours.} \\
 612 \\
 \hline
 \end{array}$$

$(68) \overline{) 3600} \begin{array}{r} 52 \\ 68 \\ 64 \end{array}$ minutes.

23. If a cannon may be dis-
charged twice with 6 lb. of
powder; how many times will 7 cwt.
3 qrs. 17 lb. discharge the same piece:
Ans. 295 times.

Ch. 2 :: 7th 3rd 17th 295 times.

$$\begin{array}{r} 7 \\ 31 \\ 28 \\ \hline 255 \\ 235 \\ \hline 885 \\ 2 \\ \hline 6 \overline{) 1470} \\ 295 \end{array} \text{ Ans.}$$

24. ~~What number is~~
~~that to which if you add $\frac{2}{3}$.~~
~~the quotient will be 218. Ans. 15~~

21. What number is that, to which
if you add $\frac{2}{3}$ of itself, the sum will be
20? Apr. 12.

$$\begin{array}{r} 6 \\ 2 \\ 3 \overline{) 12} \\ \underline{6} \\ 10 \\ 20 \\ \underline{18} \\ 20 \\ 30 \\ \underline{30} \\ 0 \end{array}$$

25. What number is that which
being divided by $\frac{1}{4}$ the quotient will be 21.

$21 \times 4 = 84$ Ans. 84.

$1 \times 4 = 4$

$$\frac{21 \times 3}{1 \times 4} = \frac{63}{4} = 15\frac{3}{4} \text{ Ans}$$

26. What number is that, which being multiplied by 15 the product will be $\frac{29}{40}$? Ans. $\frac{29}{40}$.

$$\frac{15 \times 3}{1 \times 1} = \frac{3 \times 3}{60} = \frac{1}{20} \text{ Ans.}$$

27. What number is that, from which if you take $\frac{1}{2}$ the remainder will be $\frac{1}{3}$? Ans. $\frac{29}{10}$.

$$\begin{array}{r} 24 \\ 8 \times 3 = 24 \\ 5 \times 1 = 5 \\ \hline 29 \\ 140 \end{array}$$

28. What number is that whose half is equal to its square? Ans. 5.

$$\begin{array}{r} 7 \\ 35 : 7 : 49 \\ 49 \overline{) 245} \cdot 5 \text{ Ans.} \\ 245 \end{array}$$

30. In what time will 500 dollars amount to 1000. at 6 per cent. per annum?

Ans. 16 years 8 months.

$$\begin{array}{r} 500 \text{ years } 1000 \\ 30.00 : 1 :: 500 \\ 30 \overline{) 500} \cdot 16 \text{ years.} \\ 300 \\ 200 \\ 100 \end{array}$$

$$\begin{array}{r} 1200 \\ 30 \overline{) 240} \cdot 8 \text{ months.} \\ 240 \end{array}$$

29. A gentle man wishing to distribute some money among a number of children found he wanted 8 cents to give them 3 cents a piece. he therefore gave each 2 cents and had three cents left: how many children were there? Ans. 11.

$$\begin{array}{r} 6 \\ 12 \\ 15 \\ 10 \\ 5 \\ 18 \\ 90 \end{array} \quad \begin{array}{r} 6 \\ 18 \\ 10 \\ 5 \\ 12 \end{array} \quad \begin{array}{r} 18 \\ 36 \\ 39 \\ 7 \\ 42 \\ 12 \end{array} \quad \begin{array}{r} 18 \\ 54 \\ 8 \\ 16 \\ 39 \\ 7 \\ 42 \\ 90 \\ 12 \end{array}$$

error 7
error 5
12

12) 132
11 ans.

31. When $\frac{1}{2}$ of the members of congress were absent 15 there were $\frac{1}{3} + 10$ absent: how many members were in all?

Ans. 150.

$$\begin{array}{r} \frac{1}{2} \quad 60 \quad \frac{1}{3} \\ 15+ \quad 30 \quad 5 \\ 15+ \quad 15 \quad 15 \\ 45 \quad 15 \\ 10 \quad 10 \\ 75 \quad 10 \\ 60 \quad 10 \\ 15 \quad 10 \\ 5 \end{array}$$

$$\begin{array}{r} 60 \quad 15 \\ 150 \quad 100 \\ 1350 \quad 600 \\ 1800 \quad 600 \\ 5 \overline{) 750} \text{ Ans.} \\ 150 \end{array}$$

32. If the earth be 360 degrees round. each 69 $\frac{1}{2}$ miles. how long would it take a man to travel once around. at 20 miles a day. admitting there were no obstacles in the way. and reckoning 365 $\frac{1}{4}$ days in the year?

Ans. 3 years 155 $\frac{1}{2}$ days.

$$\begin{array}{r} 360 \\ 69 \frac{1}{2} \\ 25080 \\ 20 \overline{) 25080} \\ 12540 \\ 10950 \\ 15525 \end{array}$$

365.25) 125100 (3 years.
109575
15525 Days.

33. What is the mean time for paying 100 dollars at $3\frac{1}{4}$ months. 150 dolls. at $11\frac{1}{2}$ months. and 200 dolls. at $5\frac{1}{4}$ months? Ans. 14 months. $23\frac{13}{224}$ days.

$$\begin{array}{r} 100 \times 3.25 = 325 \\ 150 \times 11.5 = 1725 \\ 200 \times 5.25 = 1050 \\ \hline 454 \end{array}$$

$$\begin{array}{r} 454 \overline{) 2173} \quad (11 \text{ months.} \\ \underline{1816} \\ 357 \\ \underline{330} \\ 27 \end{array}$$

$$\begin{array}{r} 27 \overline{) 23134} \text{ Days} \\ \underline{1908} \\ 4054 \\ \underline{3636} \\ 418 \\ \underline{3636} \\ 542 \end{array}$$

$$\begin{array}{r} 2 \overline{) 254} = 127 \\ 115 \overline{) 134} = 1 \end{array}$$

34. If A can do a piece of work alone in 4 days. and B do the same in 12. how long will it require the m both toge ther? Ans. $4\frac{8}{19}$ Days.

$$\begin{array}{l} 4:1::1:\frac{1}{4} \\ 12:1::1:\frac{1}{12} \\ \hline \frac{12}{4} \times 1 = 3 \\ 4 \times 1 = 4 \\ \hline 7 \end{array}$$

$$\begin{array}{l} 7:12::19:127 \\ 19 \overline{) 127} \\ \underline{76} \\ 51 \\ \underline{46} \\ 5 \end{array}$$

35. A minor of 14 years of age had an annuity left him of 400 dolls; this sum his guardian agreed to receive yearly. and allow him com pound interest at 5 per cent. thereon. Tell he should arrive at 21 years of age; how much must he then receive? Ans. 3256 dollars 80 cts.

| | | |
|---|---|------------|
| $\begin{array}{r} 400 \\ 10.00 \\ \hline 410.00 \end{array}$ | 1 | 400 |
| $\begin{array}{r} 410.00 \\ 20.00 \\ \hline 430.00 \end{array}$ | 2 | 410 |
| $\begin{array}{r} 430.00 \\ 21.00 \\ \hline 451.00 \end{array}$ | 3 | 420 |
| $\begin{array}{r} 451.00 \\ 22.55 \\ \hline 473.55 \end{array}$ | 4 | 440 |
| $\begin{array}{r} 473.55 \\ 23.64 \\ \hline 497.19 \end{array}$ | 5 | 463.05 |
| $\begin{array}{r} 497.19 \\ 24.81 \\ \hline 522.00 \end{array}$ | 6 | 486.20.25 |
| $\begin{array}{r} 522.00 \\ 26.01 \\ \hline 548.01 \end{array}$ | 7 | 510.51.26 |
| $\begin{array}{r} 548.01 \\ 27.25 \\ \hline 575.26 \end{array}$ | | 536.03.82 |
| | | 3256.80.33 |

Ans.

36. Sold goods to the amount of 700 dolls. for 12 months; what was the present worth, at 5 percent simple interest? Ans. 685.52 + 52 cts.

Months

$$\begin{array}{r} 12 \overline{) 20} \\ 100 \end{array}$$

$$101.6666 : 100 :: 100$$

$$\begin{array}{r} 101.6666 \overline{) 70000.000000} \\ 6099996 \\ \hline 9000040 \\ 8133328 \\ \hline 8667120 \\ 8133328 \\ \hline 5337920 \\ 5083330 \\ \hline 2545900 \\ 2033332 \end{array}$$

37. Three persons. A. B. and C. purchased a lot in partnership. for which A advanced \$ B. and C. 110 dollars; what did A and B pay. and what part of the lot belonged to C?

Ans. A had 967 dolls. 27 + cts.
B had 305 — 45 1/2
and C had 11/56 parts.

$$\begin{array}{r} 3 \frac{3}{7} \\ 8 \frac{7}{7} \\ 7 \\ \hline 56 \\ 7 \times 3 = 21 \\ 67 \quad 8 \times 3 = 24 \\ \hline 45 \\ 56 \\ \hline 11 \\ \hline \text{Ans } 56 \end{array}$$

$$\begin{array}{r} 11 : 140 :: 21 \\ 21 \\ \hline 560 \\ 280 \\ \hline 11 \overline{) 3360} \quad 305.45 \frac{5}{11} \\ 3200 \\ \hline 160 \\ 55 \\ \hline 50 \\ 44 \\ \hline 60 \\ 55 \\ \hline 5 \\ 11 \end{array}$$

$$\begin{array}{r} 11 : 140 :: 21 \\ 21 \\ \hline 140 \\ 280 \\ \hline 11 \overline{) 2940} \quad 267.27 + \frac{1}{11} \\ 2200 \\ \hline 740 \\ 74 \\ \hline 66 \\ 80 \\ \hline 77 \\ 30 \\ \hline 22 \\ 80 \\ \hline 44 \\ 31 \end{array}$$

38. A gentleman finding several beggars at his door. gave to each four cents. and had sixteen left. but if he had given to each six cents. he would have wanted twelve; how many beggars were there? Ans. 14.

$$\begin{array}{r} 10 \quad 10 \quad 12 \quad 12 \\ 4 \quad 6 \quad 4 \quad 6 \\ \hline 40 \quad 60 \quad 48 \quad 72 \\ 56 \quad 12 \quad 48 \quad 12 \\ \hline 48 \quad 48 \quad 64 \quad 60 \\ 8 \quad 4 \quad 4 \end{array}$$

$$\begin{array}{r} 10 \quad 8 = 96 \\ 12 \quad 4 = 48 \\ \hline 14 \quad 56 \\ \hline 14 \end{array}$$

39. B. and C. can build a wall in 18 days. but with the assistance of A. they can do it in 11 days; in what time can A do it alone? Suppose the work to consist of 198 parts.
Then $198 \div 18 = 11$ parts performed by B and C. in one day.
Again. $198 \div 11 = 18$ performed by A. B. and C. in one day.
But $18 - 11 = 7$ parts performed by A alone.

and A. 7 : 1 :: 198 : 28 3 25 5/7 Ans.

7:1::192

1192 28 6

586

12

1192 3 16

360

1192 25 5

140

355

6 36 7 16

28. 3. 25 5/7 Ans.

40. Twenty members of congress. 30 merchants. 24 lawyers and 24 citizens. spent at a dinner 192 dollars, which sum was divided among them in such a manner that 11 members of congress paid as much as 5 merchants 10 merchants as much as 16 lawyers and 8 lawyers as much as 12 citizens; the question is to know the sum of money paid by all the members of congress; also by the merchants, lawyers and citizens?

Ans. The 20 members of congress paid 60 dollars, the 30 merchants paid 72, the 24 lawyers paid 36, and the 24 citizens paid 24.

| | | | | |
|-------------|---------|----------|---|----|
| 16 congress | 20 each | Spent to | = | 5 |
| Merchants | 30 | | = | 6 |
| Lawyers | 24 | | = | 3 |
| Citizens | 24 | | = | 2 |
| | | | | 16 |

If 16:192::5

16) 360 (60 the Congress

If 16:192::6

16) 1152 (72 Merchants

If 16:192::3

16) 576 (36 Lawyers

If 16:192::2

16) 384 (24 citizens

41. What difference is there between a piece of ground 28 perches long by 20 broad and two others each of half those dimensions?

Ans. 1 acre 3 qrs.

28
20
2) 560
160) 280 (1 acre.
40) 120 (3 qrs.

42 Required the dimensions of a parallelogram containing 200 acres which is 40 perches longer than wide? Ans. 200 perches by 160.

40) 3200 (20
160) 3200 (200

20:3200::200

20) 640000
160) 32000 (200

113. How many acres are contained in a square field the diagonal of which is 20 perches more than either of its sides?

Ans. 14 acres 2 qrs. 11 per

$$\begin{array}{r} 30 \\ 900 \\ 900 \\ 1800 \\ 16 \\ 82 \\ 164 \\ 344 \\ 3396 \end{array}$$

$$12.4 : 30 :: 20$$

$$\begin{array}{r} 12.4 \overline{) 600.0} (48.3 \\ 496 \\ 1040 \\ 992 \\ 480 \\ 372 \\ 108 \end{array}$$

$$\begin{array}{r} 48.3 \\ 48.3 \\ 1449 \\ 3864 \\ 1932 \\ 40 \overline{) 2332.89} \\ 4 \overline{) 58:1} \\ 14.2.12 \text{ Ans} \end{array}$$

$$36514 : 73028 :: 88$$

$$\begin{array}{r} 36514 \\ 292112 \\ 73028 \\ 365140 \\ 438168 \\ 219084 \\ 3800000 \overline{) 2666544392} (30.301 \\ 264000000 \\ 265443920 \\ 264000000 \\ 144392000 \\ 28000000 \\ 56392000 \end{array}$$

114. The paving of a triangular yard at 18d. per foot. came to 100l; the longest of the three sides was 88 feet; what then was the sum of the other two equal sides? Ans. 106.85 feet.

$$18 : 1 :: 100$$

$$\begin{array}{r} 20 \\ 2000 \\ 18 \overline{) 24000} (1333.333 \\ 54 \\ 540 \\ 540 \\ 540 \\ 540 \\ 540 \\ 540 \end{array}$$

$$\begin{array}{r} 1333.3330 (36.514 \\ 9 \\ 66 \overline{) 483} \\ 725 \overline{) 3625} 50 \\ 730.1 \overline{) 107301} \\ 73014 \overline{) 342900} \\ 292056 \\ 50844 \end{array}$$

$$\begin{array}{r} 44 \\ 44 \\ 176 \\ 176 \\ 7936 \end{array}$$

$$\begin{array}{r} 30301 \\ 30301 \\ 30301 \\ 909030 \\ 918150601 \\ 1936 \\ 2854.150601 (53424 \\ 25 \\ 106.848 \text{ Ans.} \end{array}$$

$$\begin{array}{r} 103 \overline{) 359} \\ 106.4 \overline{) 4515} \\ 1068.2 \overline{) 25906} \\ 21362 \\ 454401 \\ 424376 \\ 37025 \end{array}$$

115. Required the length of a line by which a circle that shall contain just half an acre may be laid off? Ans. $27\frac{3}{4}$ yards.

$$\begin{array}{r} 2) 160 \\ 80 \end{array} \begin{array}{r} 8.74 \\ 64 \\ 16.7 \end{array} \begin{array}{r} 1600 \\ 1521 \\ 178.4 \end{array} \begin{array}{r} 7900 \\ 7116 \end{array}$$

$$\begin{array}{r} 1.12837 \\ 8.94 \\ 451348 \\ 1015533 \\ 902696 \\ 10.0876278\frac{1}{2} \\ 504381390 \\ 501138139 \\ 2554819522 \\ 27.7401176 \text{ Ans.} \end{array}$$

116. A ceiling contains 114 yards 6 feet of plastering and the room is 28 feet broad: what is its length? Ans. $36\frac{6}{7}$ feet

$$\begin{array}{r} 114 : 6 \\ 28 \overline{) 1032} (36\frac{6}{7} \text{ Ans.} \\ 84 \\ 192 \\ 168 \\ 24 = 6 \\ 28 = 7 \end{array}$$

118. If 20 feet of iron railing weigh half a ton. when the bars are an inch and a quarter square. what will 50 feet come to at $3\frac{1}{2}$ d. per pound. the bars being cut $\frac{1}{2}$ of an inch square? Ans. 206.05.20.

$$\begin{array}{r} 20\frac{1}{4} \\ 20\frac{1}{4} \\ 25\frac{1}{4} \\ 2\frac{1}{4} \\ 2\frac{1}{4} \end{array} \begin{array}{r} 50 \\ 8 \overline{) 350} \\ 43.75 \\ 306.25 \\ 38.28125 \\ 31.25 : 10 :: 38.28125 \end{array} \begin{array}{r} \text{Cwt} \\ 31.25000 \\ 38.281250 \\ 31.25000 \\ 7031250 \\ 6250000 \\ 7812500 \\ 6250000 \\ 15625000 \\ 15625000 \end{array}$$

117. A common joist is 7 inches deep and $2\frac{1}{2}$ thick. but I want another just as big again. that shall be three inches thick: what must be its other dimensions? Ans. $11\frac{2}{3}$ inches.

$$\begin{array}{r} 7 \\ 2\frac{1}{2} \\ 14.5 \\ 17.8 \\ 3) 35.0 \\ 11\frac{2}{3} \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{ll d Cwt} \\ 1 : 3\frac{1}{2} :: 12.25 \\ 49.00 \\ 38 \\ 392 \\ 38 \\ 1372\frac{1}{2} \\ 1116 \\ 686 \\ 12) 4802 \\ 20) 110000 \\ 200000 \end{array} \text{ Ans.}$$

119. A may-pole. whose top being broke off by a blast of wind. struck the ground at 16 feet distance from the foot of the pole: what was its whole height. supposing the length of the broken piece to be 39 feet? Ans. 75 feet.

$$\begin{array}{r}
 15 \\
 13 \\
 \hline
 75 \\
 15 \\
 \hline
 225
 \end{array}
 \qquad
 \begin{array}{r}
 39 \\
 39 \\
 \hline
 351 \\
 117 \\
 \hline
 1521 \\
 223 \\
 \hline
 7296 \\
 9 \\
 \hline
 396 \\
 6.6)396
 \end{array}
 \qquad
 \begin{array}{r}
 39 \\
 36 \\
 \hline
 75
 \end{array}$$

$$\begin{array}{r}
 500 \\
 250 \\
 \hline
 250 \\
 550
 \end{array}$$

$$\begin{array}{r}
 24 \\
 216 \\
 \hline
 216 \\
 3)24 \\
 8 \\
 \hline
 64 \\
 4 \\
 \hline
 5)60 \\
 12 \\
 \hline
 96 \\
 103
 \end{array}$$

50. Required a number: from which, if 7 be subtracted, and the remainder be divided by 8, and the quotient be multiplied by 5, and 11 added to the product, the square root of the sum extracted, and three-fourths of that root cubed, the cube divided by 9, the last quotient ~~will~~ be 24?
Ans. 103.

$$\begin{array}{r}
 103 \\
 8 \\
 \hline
 896 \\
 12 \\
 \hline
 60 \\
 4 \\
 \hline
 64 \\
 8 \\
 \hline
 11)24
 \end{array}$$

51. A vintner has a cask of wine containing 500 galls. of which he draws 50 galls. and fills it up with water. He repeats the same thing five times; I demand what quantity of wine and also of water is then in the cask?

Ans. 295 galls. 1 qt. of wine and 204 galls. 3 qts. of water nearly.

Wine

$$\begin{array}{r}
 500 \\
 50 \\
 \hline
 450 \\
 45 \\
 \hline
 405 \\
 40.2 \\
 \hline
 364.2
 \end{array}$$

Water

$$\begin{array}{r}
 50 \\
 45 \\
 \hline
 50+ \\
 95 \\
 9.2 \\
 \hline
 35.2 \\
 50 \\
 \hline
 135.2
 \end{array}$$

$$500:50::450$$

$$\begin{array}{r}
 500)22500 \\
 450 \\
 \hline
 5
 \end{array}$$

$$\begin{array}{r}
 50 \\
 36.111.2 \\
 \hline
 13.2.0.12
 \end{array}$$

$$\begin{array}{r}
 500:50::364.2 \\
 2000)72900(364 \\
 14580 \\
 \hline
 2000)22900(129 \\
 12000 \\
 \hline
 2000)3600(129 \\
 2000 \\
 \hline
 2000)2200(10 \\
 1200 \\
 \hline
 2000)4800(24 \\
 4000 \\
 \hline
 4)2000=5
 \end{array}$$

$$500:50::405$$

$$\begin{array}{r}
 500)20250(40.5 \\
 2000 \\
 \hline
 250 \\
 1000(2 \\
 1000
 \end{array}$$

g qt pt gils
 364 4 0 0
 328 0 0 1
 32 3 0 1
 295 0 1 3
 204 3 0 0
 500 0 0 0
 Wine
 Water
 Ans.

3 19
 5 25
 1 5
 5 25
 5x3=15
 1x19=19
 21
 25

2 5
 5 25
 5x2=10
 1x6=6
 14
 25

52. Since a pile of
 wood 14 feet long 4 feet
 high and 8 feet broad
 makes a cord what part
 of cord will be in a pile
 of half the dimensions ea
 ch way? Ans. $\frac{1}{8}$ part.

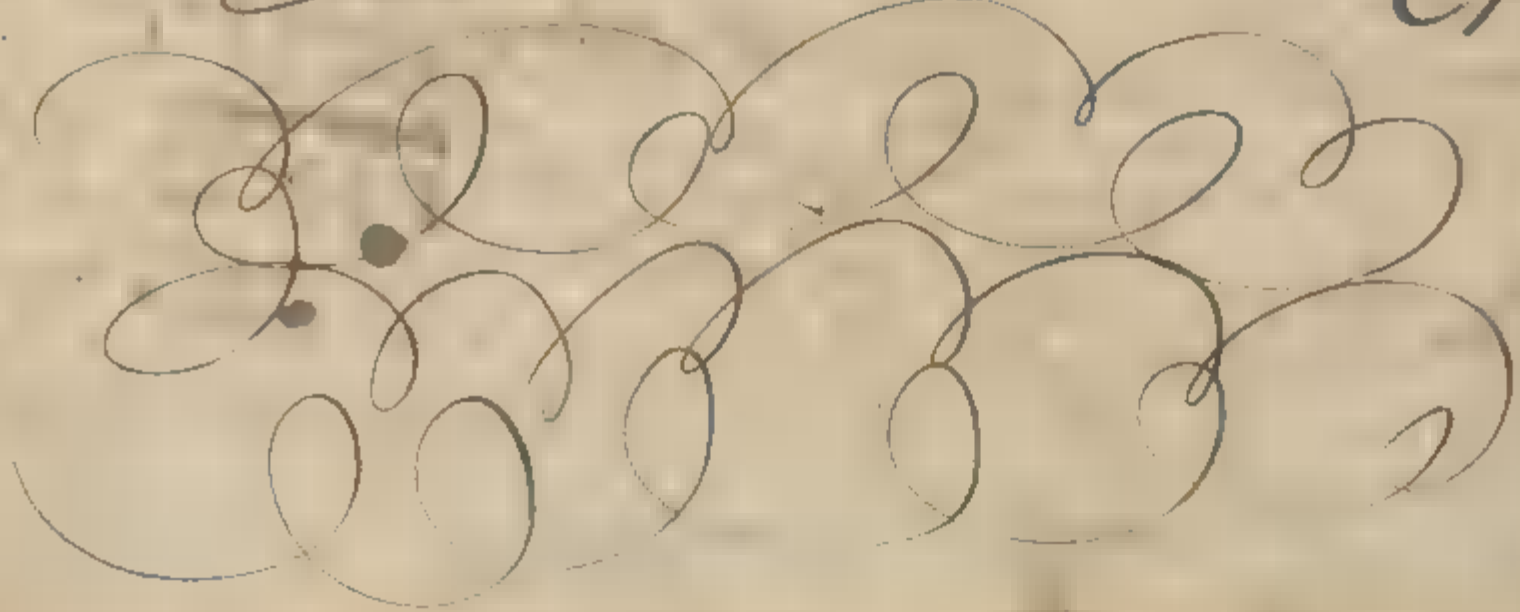
16) $\frac{16}{128} = \frac{1}{8}$ Ans.

g qt pt gils
 35 2 0 0
 13 2 0 1
 121 3 1 2
 50 3 1 2
 171 3 1 2
 14 0 1 2
 154 3 0 0
 50 3 0 0
 204 3 0 0
 Water

g g g qt pt gils
 500: 50 :: 328 0 0 1
 2000 13 12
 4000 26 24
 16000 104 96
 80000 524 880
 20000 2624 400
 240000 2624 400
 240000 2624 400
 160000 644 000
 80000 322 000
 240000 1760 000
 352 000
 1408 000
 80000 19
 32) 60800 = 25
 80000

80000 2576 000 (3 qt
 240000 1760 000
 352 000
 1408 000 (18 gils
 80000 19
 32) 60800 = 25
 80000
 50 3 0 1
 32 3 0 1
 14 0 1 2

James McCormick



53. Owed B 1864 dollars for which he gave his note on interest bearing date April 1st. 1817. On the back of the note are the following endorsements viz.

Oct. 15th. 1817. Received in cash 225 dolls. 50cts.

Jan. 10th. 1818. Received in cash 150—

Same date. a bag of coffee: weight 1 cwt. 22 lb. at 29 cts per pound

May 16th. Received 3 ton of iron at 195 dolls. per ton.

What is the sum due from D to B on the 1st of August. 1818?

1864
195
3320
16776
1864
60) 363480
60.58
1699.08
85
849548
1359264
60) 14412180
24.07.00

1534.2903
126
92057418
184114836
60) 1933205478
32.22.0096

D 6
18.64.00 principal
60.58 interest
1924.58 amount
225.50 Receipt
1699.08 second principal
24.07 sec interest
1423.15 amount
188.86 Receipt
1534.29 third pri
32.22 inter
1566.51 amount
555.00 Receipt
1011.51 fourth pri
12.47.5 interest
1023.98.5 Ans.

195 150.22
555 4
22
134
29 cts
1206
268
38.86
150
188.86

101151
74
404604
708057
60) 7485174
12.47.5

54. How many cords are there in a pile of wood 36 feet long 6 1/2 feet wide and 8 1/2 feet high?

8.75
6.5
11375
5250
56875
36
341250
170625
123.000) 2047.500 (15. Ans.
128000
767.500
640000
124500
1280000

55. A man spends 356 dolls
 34 cents per year. how much will
 it be per day?

Days 365
 $365 \overline{) 356.34 } (97 \text{ Ans.}$
 $\begin{array}{r} 3295 \\ 2784 \\ 2555 \\ 229 \\ 385 \end{array}$

56. A bankrupt. whose whole
 property is worth 2564 dolls. 95 1/2
 cents. can pay his creditors but
 18 3/4 cents on a dollar; how much
 does he owe?

$18.75 : 1 :: 2564.95.50$
 $1875 \overline{) 2564.95.50 } (13679 + \text{Ans.}$
 $\begin{array}{r} 1875 \\ 6899 \\ 5825 \\ 12745 \\ 11250 \\ 14955 \\ 13750 \\ 11800 \\ 16500 \\ 1425 \end{array}$

57. If 8 men spend 20 dollars 50
 cents in 2 days. how long will 64
 men be in spending 100 dollars at
 the same rate?

$20.50 : 30 :: 64$
 $\begin{array}{r} 8200 \\ 12300 \\ 131200 \end{array}$
 $131200 \overline{) 2400000 } (18 \frac{12}{41} \text{ Ans.}$
 $\begin{array}{r} 80000 \\ 30 \\ 1088000 \\ 1049600 \\ 384000 \\ 32 \overline{) 1312000 } (41 \frac{12}{41} \end{array}$

58. A bridge built
 over a stream in 6 months.
 34 men being waste
 away by a flood. how
 long time will it take 86
 men to build another in its place
 of twice as much work?

months days men
 6 22 34 } : 6 :: 86

59. Three gardeners.. A. B and C.
 having bought a piece of ground. find the
 profits of it to amount to 240 dolls. a year: now
 the sum of money which they gave. was in such propor
 tion. that as often as A paid 5 dolls. B paid 7, and as often
 as B paid 11 dolls. C paid 6: how much must each man receive for
 his share of the profits per annum?

$5 \times 4 = 20$
 $7 \times 4 = 28$
 $6 \times 7 = 42$
 $90 : 20 :: 240$
 $90 \overline{) 4800 } (53.33 \frac{1}{3}$
 $90 : 28 :: 240$
 $90 \overline{) 6720 } (74.66 \frac{2}{3}$
 $90 : 42 :: 240$
 $90 \overline{) 10080 } (112$
 240.00 Prop

60. If a county tax of 7 cents and 3 mills is assessed on property, how much must that ~~man~~ pay whose property is valued at \$564 dollars 20 cents?

$$\begin{array}{r} 100 : 7.3 :: 564.20 \\ 2567260 \\ 5994910 \\ 100) 62518660 \end{array}$$

61. Suppose a cistern having a pipe which conveys 11 gallons 2 quarts into it in an hour, and ~~the~~ has another that lets out 2 gallons 2 quarts and 1 pint in an hour; in what time will it be filled, allowing it to contain $8\frac{1}{2}$ gallons?

$$\begin{array}{r} 9 \text{ gal } 2 \text{ qt } 0 \text{ pt} \\ 4 \text{ gal } 2 \text{ qt } 0 \text{ pt} \\ 1 \text{ gal } 2 \text{ qt } 0 \text{ pt} \\ 1 \text{ gal } 3 \text{ qt } 1 \text{ pt} : 1 :: 8\frac{1}{2} \\ 338 \text{ gal } 11 \text{ qt } 1 \text{ pt} \\ 15) 67645.4 \text{ Ans.} \\ 46 \\ 60 \text{ mi} \\ 760 \end{array}$$

62. What is the length of a lane, which being 36 feet wide, that will contain just one acre of ground?

$$\begin{array}{r} 160 \\ 160 \\ 360 \\ 160 \\ 36) 2640 \end{array} \quad 73.3 \text{ Ans.}$$

$$\begin{array}{r} 43.3 \\ 36 \\ 438 \\ 2192 \text{ proof} \\ 2640 \end{array}$$

63. If 50 men consume 12 bushels of grain in 30 days, how much will 40 ~~men~~ consume in 90 days?

$$\begin{array}{r} 50 \text{ men} \\ 30 \text{ days} \\ 1500 \\ : 12 :: 40 \text{ men} \\ 90 \text{ days} \\ 3600 \\ 1500) 43200 \end{array} \quad \begin{array}{r} 28\frac{4}{5} \\ 3000 \\ 13200 \\ 12000 \\ 3) 12000 \end{array}$$

64. A gentleman had 18 dollars 90 cents to pay among his laborers; to every boy he gave 6 cents, to every ~~man~~ 8 cents, and to every ~~man~~ 16 cents; now there were three women for every boy, and two men for every woman; required the ~~the~~ number of each?

$$\begin{array}{r} 3 \times 6 = 18 \text{ B} \\ 9 \times 8 = 72 \text{ W} \\ 18 \times 16 = 288 \text{ M} \\ 328 : 3 :: 18.90 \\ 328) 5670 \\ 990 \\ 1890 \end{array}$$

15 Boys
45 Women
90 Men

$$\begin{array}{r} \text{Proof} \\ 15 \times 6 = 90 \\ 45 \times 8 = 360 \\ 90 \times 16 = 1440 \\ 1890 \text{ proof} \end{array}$$

65. Two men depart from the same place and travel the same way. the one travels at the rate of 3 miles an hour, for 8 hours every day. the other goes at the rate of $4\frac{1}{2}$ miles. for 7 hours each day; how far are they apart at the end of 13 days?

$\begin{array}{r} 76 \\ 8 \\ 3 \\ 24 \\ 13 \\ 42 \\ 24 \\ \hline 312 \end{array}$
 $\begin{array}{r} 76 \\ 7\frac{1}{2} \\ 28 \\ 3.5 \\ 31.5 \\ 1.3 \\ 9.45 \\ 31.5 \\ 409.5 \\ 312 \\ \hline 977.5 \text{ m} \end{array}$
 Ans. 977.5 m

66. A began to trade on the 1st of January. with a capital of 962 dollars: on the 15th of April following. he took in B as a partner. with 1635 dollars: on the 1st of July. A put in 320 dollars more. and 1 month after B drew out $\frac{1}{4}$ of his capital: on the last day of December. on settling their accounts. they found a gain of 486 dollars 64 cents: what was each partner's share?

$$962 \times 12 = 11544$$

$$320 \times 6 = 1920$$

$$1635 \times 8\frac{1}{2} = 13897.5$$

$$408.75 \times 5 = 2043.75$$

$\begin{array}{r} 11544 \\ 13464 \\ \hline 11853.75 \\ 25317.75 \end{array}$

$\begin{array}{r} 13897.5 \\ 2043.75 \\ \hline 11853.75 \end{array}$

$$25317.75 : 486.64 :: 11853.75 : 486.64$$

$$25317.75 : 486.64 :: 11853.75 : 486.64$$

$\begin{array}{r} 5385600 \\ 80184 \\ 80744 \\ 107712 \\ 53856 \\ \hline 25317.75 \end{array}$
 $\begin{array}{r} 6952120.9500 \\ 5068550 \\ 14885709 \\ 12658875 \\ 22268346 \\ 20254200 \\ 201441460 \\ 17722425 \\ 25190250 \\ \hline 25789975 \end{array}$

$\begin{array}{r} 4741500 \\ 7112250 \\ 7112250 \\ 9483000 \\ 4741500 \\ \hline 25317.75 \end{array}$
 $\begin{array}{r} 5768508.9000 \\ 5063550 \\ 7049589 \\ 5063550 \\ 19860390 \\ 14422425 \\ 21379650 \\ 20254200 \\ 11254500 \\ 10127100 \\ \hline 227845 \end{array}$

B 227.84
 A 258.79
 486.63

67. Suppose the Ohio river to be 250 feet wide. 6 feet deep. and runs at the rate of 3 miles an hour: in what time will it fill a cistern of two miles in length. breadth and depth. the mile being 5280 feet?

Proof

5286
15840
15000
79200000
15840
137600000

1760
5286
10560
10560
633600
52800
105600
111513600
10560
6690816000
557568000

1500
15000

ft. 137600000:1::1 147583616000 (4956.9.36 Ans.
950400000
2271836160
2138400000
13311361600
1798000000
1463616000
1425600000
3801600000 9m
2180960000
2138400000 (36 Sc
1425600000
8553500000
1128000000
1425600000
1425600000

68. A sloth was observed climbing a tree at the rate of $9\frac{1}{2}$ inches every day, but during the night slipped down $6\frac{3}{4}$ inches; how long will it be in reaching a limb 45 feet 6 inches from the ground?

ft.
9
6
2
11:1::

ft.
45
9
35
112
11142 (12 10
11 13 11 Ans.
32
22
11

69. In an orchard of fruit trees, $\frac{1}{2}$ of them bear apples, $\frac{1}{3}$ peaches, $\frac{1}{4}$ cherries, & plums, and 46 are pear: how many trees does the orchard contain?

360
46

23) 16560 (21720 ans
1440
2160
1440
460
460

Drop 460/proof

2) 1111
1549
22
1800
2360
1800
542
8945
9440
339
360

23
360

70. An old soldier lately received a sum of money ~~the~~ pension from government: of this sum he paid 94 dollars in the payment of debts which he then owed. half of what remained he lent to a friend. and a fifth he gave for a suit of cloths: he then found that nine-tenths of his money was gone: what ~~sum~~ did he at first receive?

$$\begin{array}{r} 100 \\ 94 \\ 2) 306 \\ 3) 153 \\ 61.2 \\ 94 \\ 308.2 \end{array}$$

$$\begin{array}{r} 100 \\ 2600 \\ 3082 \\ 518 \end{array}$$

$$\begin{array}{r} 600 \\ 24 \\ 2) 506 \\ 253 \\ 101.2 \\ 94 \\ 1418.2 \end{array}$$

$$\begin{array}{r} 600 \\ 9 \\ 3400 \\ 448.2 \\ 91.8 \\ 51.9 \\ 400 \end{array}$$

1st Error
2nd Suppos

$$\begin{array}{r} 51800 \\ 310800 \end{array}$$

91.8 Second Error
100 first Suppos

$$\begin{array}{r} 367200 \\ 310800 \end{array}$$

$$\begin{array}{r} 141 \\ 94 \\ 2) 47 \\ 3) 23.5 \\ 94 \\ 126.9 \end{array}$$

$$\begin{array}{r} 141 \\ 94 \\ 10) 1269 \\ 126.9 \end{array}$$

$$\begin{array}{r} 100) 56110 \\ 141 \end{array} \text{ Ans}$$

71. What number is that of which the difference be taken its third and fourth parts is 141

$$\begin{array}{r} 3) 150 \\ 50 \\ 37.5 \\ 12.5: 150:: 84 \\ 430 \\ 4200 \\ 12.5) 126000 (10080 Ans \\ 125 \\ 1000 \\ 10000) 31008 \\ 336 \\ 232 \\ proof 84 \end{array}$$

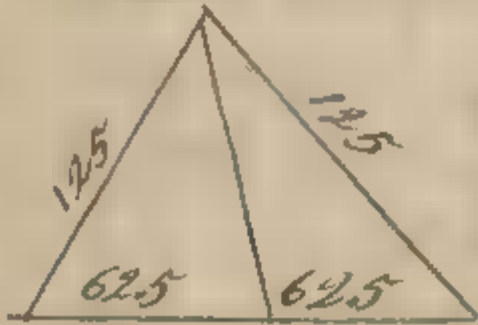
72. In turning a chaise within a circle of a ~~given~~ diameter. it was discovered that ~~the~~ the outer wheel turned thrice. while the inner turned twice: now supposing the axle tree is ~~at~~ tang. and the wheels of ~~equal~~ size. the length of the circumference described by each wheel is required?

$$\begin{array}{r} 3.1416 \\ 16 \\ 188496 \\ 31416 \\ 2) 502656 Circum of 1 \\ 251328 \end{array}$$

$$\begin{array}{r} 3.1416 \\ 24 \\ 125664 \\ 62832 \\ 3) 753984 Circum of 2 \\ 251328 \end{array}$$

$$\begin{array}{r} 100 \\ 110 \\ 120 \\ 130 \\ 140 \\ 150 \\ 160 \\ 170 \\ 180 \\ 190 \\ 200 \end{array}$$

13. The sum of the sides of an equilateral triangle is 125 feet;
required the area thereof?



$$\begin{array}{r}
 125 \\
 125 \\
 \hline
 250 \\
 125 \\
 \hline
 375 \\
 15425 \\
 \hline
 3406.25 \\
 17519.75 \quad (2) \quad 107.32 \text{ root of the difference of the squares} \\
 \hline
 2071519 \\
 2143) 6429 \\
 \hline
 2146.2) 59600 \\
 \hline
 16676
 \end{array}$$

53.66

$$\begin{array}{r}
 62.5 \\
 62.5 \\
 \hline
 125 \\
 3125 \\
 \hline
 1250 \\
 3750 \\
 \hline
 3906.25
 \end{array}$$

53.66

$$\begin{array}{r}
 53.66 \\
 125 \\
 \hline
 26530 \\
 10732 \\
 \hline
 5366 \\
 6707.50
 \end{array}$$

Ans.

James McCormick
His Book 1822

James McCormick His Book

LC & P

$$\begin{array}{r} 7 \overline{) 25 \dots 16 \dots 9 \frac{25}{63}} \\ \underline{3 \dots 13 \dots 9 \frac{1103}{7441}} \\ 25 \dots 16 \dots 9 \frac{25}{63} \end{array}$$

Ans
Proof

$$\begin{array}{r} \frac{1103}{7441} \times \frac{1}{7} \\ \hline 2821 \quad (6 \frac{25}{63}) \\ \underline{2646} \\ 175 \quad 25 \\ 7 \overline{) 441 = 63} \end{array}$$

Rule for dividing
twice the whole numbers
as usual and what is over
multiply the Denominator
with it and add in the numer
rator. for a new denominator
numerator. and multiply the
Denominator with the Divisor
for a new Denominator

Divide roll of beef between
A B and C give D $\frac{1}{3}$ B $\frac{1}{4}$ and C $\frac{1}{5}$

$$\begin{array}{l} 3 \\ 4 \\ 5 \\ \hline 60 = 20 \\ 60 = 15 \\ 60 = 12 \end{array}$$

$$47:20::15$$

$$\begin{array}{r} 47 \overline{) 300} \quad (6 \frac{12}{47}) \\ \underline{282} \\ 18 \\ 47 \end{array}$$

$$47:20::12$$

$$\begin{array}{r} 47 \overline{) 240} \quad (5 \frac{5}{47}) \\ \underline{235} \\ 5 \end{array}$$

$$\begin{array}{r} 47:20::20 \\ 47 \overline{) 400} \quad (8 \frac{24}{47}) \\ \underline{376} \\ 24 \\ 47 \end{array}$$

$$\begin{array}{r} A \quad 8 \frac{24}{47} \\ B \quad 6 \frac{12}{47} \\ C \quad 5 \frac{5}{47} \end{array}$$

James M. C.

$$\begin{array}{r} 20 \overline{) 47} \\ \underline{16} \\ 11 \end{array}$$

$$\frac{1}{3} \times \frac{1}{4} \times \frac{1}{5} = \frac{1}{60}$$

$$\frac{47}{60} : 20 :: 3$$

$$\begin{array}{r} 47 \overline{) 1200} \quad (8 \frac{24}{47}) \\ \underline{1128} \\ 72 = 24 \\ 3 \overline{) 441 = 47} \end{array}$$

Ans

James

James

Georges Township January 20 - 1825

| | | |
|----|--|--|
| 26 | Noble McCormick dr to one days work breaking flax at 33 1/2 cts per day | 33 1/2 |
| | Noble McCormick dr to one and a half Days work coping sawlogs | 1 1/2 |
| | Noble McCormick dr to Three days and a halfs work thrashing out wheat and cleaning up and going to mill | 3 1/2 |
| | Noble McCormick dr to one days work breaking flax | 1 |
| | Noble McCormick dr to four Days work halling sawlogs | 4 |
| | Noble McCormick dr to one days work halling rails | 1 |
| | Noble McCormick dr to three days work empty halling of stone and one days work making a waggon box and halling stone | 4 |
| | Noble McCormick dr to two days work halling rails and capful poles and a half a days work going to mill | 2 1/2 17 1/2 Days |

To

James H. McCormick

22/22

21

10 Gallons one and a half or two and
a half for 20 fifty sent bucket full
one a half Two pints and a half

Received of Mr James H. McCormick

one dollar & forty two cents the
balance in full of his account

1.42 3 2nd March 1826 Joshua Hays

22
200

00

7/10

6.6

Dis Peprary 17 Madison

Colombo 031 Mix { take a large tea spoon full
 Magnesia alba 31 them } every morning Noon & evening a
 half hour after eating in a little
 water

92-8
 9008
 112

1.000

.222

222.000

To find the Solidity of a Cannon Ball whose circumf
 is 12 Inches

Circumf is as 3.1416 to 1 Diameter

As 3.1416 : 1 :: 12

(6)

3.1416) 12.00 (3.82 Diameter

942
 2580
 2512
 680
 628

.636

12 Inches

3.82

45.84
 .636

27504
 14752
 27504

29.25424

Answer - Center Inches of the 6

| | | | | | |
|--|---|---|---|---|---|
| | | | 3 | | |
| | | 2 | 7 | 6 | |
| | 1 | 9 | 5 | 1 | 9 |
| | | 4 | 3 | 8 | |
| | | | 7 | | |

| | | | |
|---|---|---|---|
| 1 | 2 | 7 | 6 |
| 9 | 5 | 1 | |
| 4 | 3 | 8 | |

7 a
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of

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60



Howe's Doctring for the Bats first Bleed in the
mouth and then hold up there head about fif teen
minnets and then give them as much in dige as will
lie one alevengenny bit in three gills of whiskey

Tatt and ingen meal half
each made up with milk for
the neck pottice warm

Salts of wormwood put one table spoonful
in a quart of ^{strong} vinegar half table spoonful
to be given every hour untill the fever a
bats

44
3.52

| | |
|------|------|
| 42 | 152 |
| 28 | 164 |
| 50 | 550 |
| 1 25 | 3,96 |
| 275 | 278 |
| | 118 |

weaving 44 yards and spinning 12 dozen — 200

graster

one order to the store

seventy five cents worth of pork, 25 Rachel fields

twenty five cents worth of butter 5.17

fish twenty five cents worth

| | |
|-----|--------|
| 292 | 5.52 |
| 100 | 5.17 |
| 75 | 35 due |

James
Dunlop
J. Dunlop

Quinto

John

OF
JOHN

72

Henry Gould

20

1877

21 Mar 1977

卷之四

A Gentleman divided his Estate among
 his several sons Equally by the first he
 gave 100 and $\frac{1}{5}$ of the balance the second
 he gave 200 and $\frac{1}{5}$ of the balance the third
 he gave 300 and $\frac{1}{5}$ of the balance And so on
 till he had his Estate divided how many sons
 had he and what was each mans share And
 what was his estate Ans 7 sons each 700 = 4900

$$\begin{array}{r} 1700 \\ 100 \\ \hline 5 \overline{) 1600} \\ 200 \\ 100 \\ \hline 300 \text{ first sons share} \end{array}$$

Suppose 1st 1700

$$\begin{array}{r} 1700 \\ 300 \\ \hline 1400 \\ 200 \\ \hline 1200 \\ 150 \\ 200 \\ \hline 350 \text{ second sons} \\ 300 \\ \hline 50 = 1^{st} \text{ Error} \end{array}$$

2nd 3
 Suppose 3300

$$\begin{array}{r} 3300 \\ 100 \\ \hline 5 \overline{) 3200} \\ 400 \\ 100 \\ \hline 500 \text{ first sons share} \end{array}$$

$$\begin{array}{r} 3300 \\ 500 \\ \hline 2800 \\ 200 \\ \hline 2600 \\ 325 \\ 200 \\ \hline 525 \text{ second sons share} \\ 500 \\ \hline 25 = 2^{nd} \text{ Error} \end{array}$$

$$\begin{array}{r} 1700 \quad 50 = 165000 \\ 3300 \quad 25 = 42500 \\ \hline 1700 \overline{) 122500} \\ 17500 \\ 25 \\ \hline 42500 \end{array}$$

$$\begin{array}{r} \text{diff sum of bal } 25 \overline{) 122500} \\ 225 \\ 225 \\ \hline 10000 \\ 11900 \\ 100 \\ \hline 4800 \\ 600 \\ 100 \\ \hline 700 \end{array}$$

Estate

$$\begin{array}{r} \text{Each } 700 \overline{) 4900} \\ 4900 \end{array} \quad \begin{array}{l} 7 \text{ sons each } 700 \\ \text{whole Estate } 4900 \end{array}$$

Answer

Samuel H. Carmick

Samuel H. Carmick

James H. Carmick

James H. Carmick

James H. Carmick

Philadelphia July 9th 1821
I promise to pay to John Gould or order the sum of fifty Dollars
on demand with interest till paid without deduction Value received
James H. Carmick

John Smith

on demand with interest till paid without deduction Value received

Philadelphia July 9th 1821
I promise to pay to John Gould or order the sum of fifty Dollars
on demand with interest till paid without deduction Value received

John Smith

on demand with interest till paid without deduction Value received

Philadelphia July 9th 1821
I promise to pay to John Gould or order the sum of fifty Dollars
on demand with interest till paid without deduction Value received

John Smith

on demand with interest till paid without deduction Value received

Philadelphia July 9th 1821
I promise to pay to John Gould or order the sum of fifty Dollars
on demand with interest till paid without deduction Value received

Examples of / written upon

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the writings of certain writers

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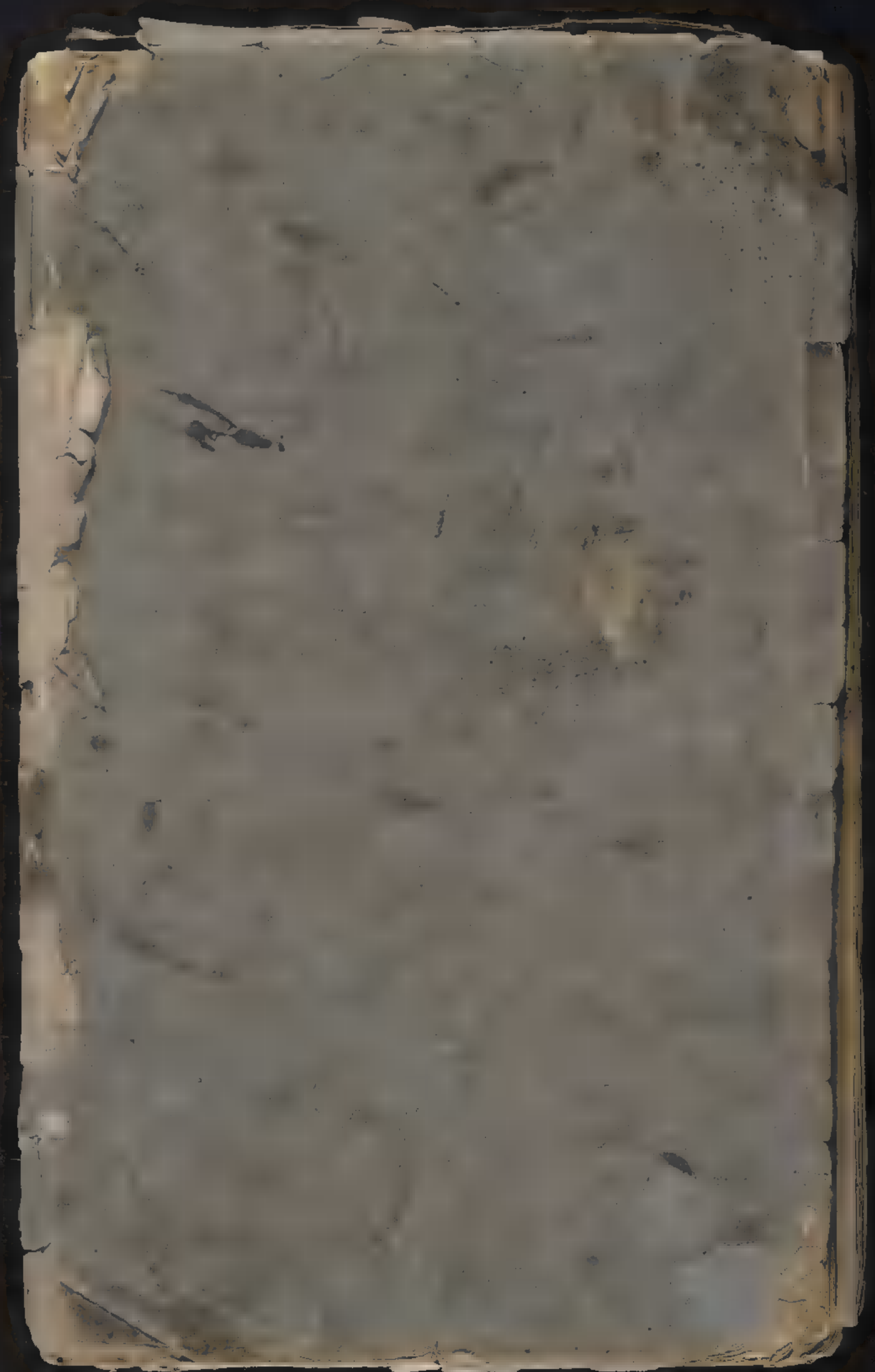
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Mr J. Williams

how

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Mary

Single Rule of Three

When a man is sold
for 1200 per ton what
will 1000 be worth

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When a man is sold
for 1200 per ton what
will 1000 be worth

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When a man is sold
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Single Rule of Three Inverse

26

30

14 men 30 days do work 12000
 for 1464 men 30 days do work 12000
 how much is it for 100 men and 12000 gallons of
 water per day for 100 men when
 the water is 12000

$$\begin{array}{r} 1464 : 12000 :: 100 : x \\ 1464 \times 12000 = 17568000 \\ 17568000 \div 100 = 175680 \end{array}$$

$$\begin{array}{r} 12000 : 1464 :: 100 : x \\ 12000 \times 100 = 1200000 \\ 1200000 \div 1464 = 820 \end{array}$$

27

100 men 100 days do work 10000
 100 men 100 days do work 10000
 how much is it for 100 men and 10000
 the water is 10000

$$\begin{array}{r} 100 : 10000 :: 100 : x \\ 100 \times 10000 = 1000000 \\ 1000000 \div 100 = 10000 \end{array}$$

31 24 men 100 days do work 10000
 containing 10000 and
 goes 12 mile a day 5 days
 after he sets out price
 for same time

28

100 men 100 days do work 10000
 what is it for 100 men 100 days do work 10000
 in how many days will
 100 men do 10000

$$\begin{array}{r} 100 : 10000 :: 100 : x \\ 100 \times 10000 = 1000000 \\ 1000000 \div 100 = 10000 \end{array}$$

$$\begin{array}{r} 100 : 10000 :: 100 : x \\ 100 \times 10000 = 1000000 \\ 1000000 \div 100 = 10000 \end{array}$$

29

100 men 100 days do work 10000
 what is it for 100 men 100 days do work 10000
 to one man 100 days do work 10000

$$\begin{array}{r} 100 : 10000 :: 100 : x \\ 100 \times 10000 = 1000000 \\ 1000000 \div 100 = 10000 \end{array}$$

32
 what is it for 100 men 100 days do work 10000
 to one man 100 days do work 10000
 to one man 100 days do work 10000

$$\begin{array}{r} 100 : 10000 :: 100 : x \\ 100 \times 10000 = 1000000 \\ 1000000 \div 100 = 10000 \end{array}$$

Multiple Choice Test

33. If 100 men consume 1 lb of meat can build 100 lbs of pork in 19 months how long will it require 20 men to build the same

$$\begin{array}{r}
 260 \text{ lbs} \\
 100 \text{ men} \\
 \hline
 2.6 \text{ lbs per man} \\
 2.6 \times 19 = 49.4 \text{ months}
 \end{array}$$

$$\begin{array}{r}
 100 \text{ lbs} \\
 20 \text{ men} \\
 \hline
 5 \text{ lbs per man}
 \end{array}$$

34. How much land at 200 lbs per acre must be sown in wheat for 2500 bushels

$$\begin{array}{r}
 2500 \text{ bushels} \\
 200 \text{ lbs per acre} \\
 \hline
 12.5 \text{ acres}
 \end{array}$$

3. If 100 men can build a bridge in 100 days how long will it require 20 men to build it

$$\begin{array}{r}
 100 \text{ men} \\
 100 \text{ days} \\
 \hline
 10000 \text{ man-days} \\
 10000 / 20 = 500 \text{ days}
 \end{array}$$

35. If the earth which is 8000 sq mi in circumference is 40 ft deep how much water will it hold at the equator

$$\begin{array}{r}
 8000 \text{ sq mi} \\
 40 \text{ ft} \\
 \hline
 320000 \text{ cu ft}
 \end{array}$$

4. If a wall 100 ft long requires 10000 bricks in what time would 2 men complete it

$$\begin{array}{r}
 10000 \text{ bricks} \\
 2 \text{ men} \\
 \hline
 5000 \text{ bricks per man}
 \end{array}$$

40. If a barrel of flour will last a family of 6 men 10 days how long will it last if 3 more were added to the family

$$\begin{array}{r}
 6 \text{ men} \\
 10 \text{ days} \\
 \hline
 60 \text{ man-days} \\
 60 / 9 = 6.67 \text{ days}
 \end{array}$$

5. If 3 Dollars is paid for the carriage of 100 wt weight 100 mi how far may it cost to move for the same money

$$\begin{array}{r}
 3 \text{ Dollars} \\
 100 \text{ wt} \\
 100 \text{ mi} \\
 \hline
 300 \text{ Dollar-mi} \\
 300 / 3 = 100 \text{ mi}
 \end{array}$$

Single Rule of Three

6 If a street 80 feet long and 20 feet wide can be paved in 115 days what time would it require if 5 more were added

$$\begin{array}{r} 80:200::60 \\ 60/21,000 \end{array}$$

7 If a field that is 80 rods long and 20 in length contains 15 acres how wide must one be to contain the same quantity that is but 40 rods long

$$\begin{array}{r} 80:200::40 \\ 40/2,400 \end{array}$$

8 If a board be 75 garters wide what length must it be to measure 12 square feet

$$\begin{array}{r} 1:12::75 \\ 75/1200 \end{array}$$

9 How much cloth 125 yds wide can be lined by 425 yds of silk that is 75 of a yard wide

$$\begin{array}{r} 125:25::125 \\ 125/3125 \end{array}$$

10 If 10 men could complete a building in 115 days what time would it require if 5 more were added

$$\begin{array}{r} 10:45:15 \\ 15/450 \\ 30 \end{array}$$

11 In what time will 600 Dollars gain 508 when

$$\begin{array}{r} 11:45:15 \\ 15/450 \\ 30 \end{array}$$

12 If a traveller can perform a journey in 11 days when the days are 12 hours long what time will he require when the days are 16 hours long

$$\begin{array}{r} 11:48:3 \\ 16/483 \end{array}$$

13 Suppose 100 men in a garrison are supplied with provisions for 30 days how many men must be sent out if they would have the provisions last 50 days

$$\begin{array}{r} 100:30::400 \\ 400/2400 \\ 14/160 \end{array}$$

Lent a friend 2928 for 6 months afterwards I bor from him 8068 how long must I keep it to be in the favour

$$\begin{array}{r} 292:6::806 \\ 806/235712 \end{array}$$

Single Rule Of Three

15
1200 men stationed in a
garrison have provision
for 9 months at the rate
of 10 ounces per day how
long at the same ~~time~~
allowance will the same
provisions last if they are
reinforced by 1100 men
and also what diminution
must be made on each
ration that the provisions
may last for the same
time

$$1200 : 9 : 1600$$

$$1600 \overline{) 10800} (6 \frac{1}{2}$$

$$4 \overline{) 16} = 4$$

$$400 : 11 : 1600$$

$$1600 \overline{) 600} (3 \frac{1}{2}$$

$$8 \overline{) 16} = 2$$

169
If a piece of land 40
rods in length and 4
in breadth make an acre
how wide must it be
if it is but 25 rods long

$$40 : 4 : 25$$

$$15 \overline{) 100} (6 \frac{2}{3}$$

$$5 \overline{) 25} = 5$$

172
How much in length
that is 3 inches broad
will make a square foot

$$12 : 12 : 3$$

$$3 \overline{) 12} = 4$$

189
A pasture field
will feed 6 cows 91 days

how long will it feed 21
cows

$$6 : 91 : 21$$

$$21 \overline{) 546} (26$$

$$1 \overline{) 26} = 26$$

199
There is a cistern having
a pipe which will empty
it in 10 hours how many
pipes of the same capacity
will empty it in 25 minutes

$$10 : 1 : 25$$

$$60 \overline{) 250} (4 \frac{1}{6}$$

$$24 \overline{) 600} (25$$

$$1 \overline{) 25} = 25$$

$$1 \overline{) 25} = 25$$

207
How many yds of carpet
that is half a yard wide
will cover a floor that is 30
feet long and 18 feet wide

$$30 : 18 : 15$$

$$15 \overline{) 450} (30$$

$$1 \overline{) 30} = 30$$

$$1 \overline{) 30} = 30$$

Single Rule of Three

219

What is the weight of the pea of a stringer 10 ft in how many days will which being suspended 39 inches from the center.

220 30 horses plough 12 in

in how many days will 40 horses plough the same ground

$$40:30::10$$

$$40 \overline{) 300} \begin{array}{r} 7 \\ 5 \end{array}$$

of motion will equiside

28 lb suspended at the draught end 34 of an inch

$$75:208::39$$

$$\frac{75}{1040}$$

$$1456$$

$$39 \overline{) 15600} \begin{array}{r} 40 \\ 156 \end{array}$$

$$156$$

39 800 soldiers in a gar

rison have provision

sufficient for 2 months

how many must depart

that that the provision

221

A and B depart from the same place and

traveled the same road

but A goes 5 days before

B at the rate of 20 miles

a day B follows at the

rate of 25 miles a day

in what time and at

what distance will he

overtake

$$20:25::5$$

$$5 \overline{) 100}$$

$$20$$

$$20:20::11$$

$$175$$

$$175$$

222

20 30 plough 12 in

how many will 40 horses

plough in the same time

$$30:40::12$$

$$30$$

$$180$$

$$180$$

$$180$$

4 Bought 11 the of mace

win for 1178 m. gals

of which cost all

what was the remainder

for gallons to gain 128

on the whole

$$\frac{11}{11} \begin{array}{r} 11 \\ 11 \end{array}$$

$$1178$$

$$54152 \times 242$$

$$125$$

$$216$$

$$232$$

$$216$$

$$100$$

$$128$$

Four Rule by Division

5. If 25 men can be carried in 10 days how many can be carried in 20 days for the same money

$$\begin{array}{r} 641542.225 \\ 225 \overline{) 1453500} \\ \underline{450000} \\ 1021500 \\ \underline{450000} \\ 571500 \\ \underline{450000} \\ 121500 \end{array}$$

6. If 6 men in 8 days earn 100 \$ how much will 12 men earn in 20 days

$$\begin{array}{r} 125 \\ 48 \overline{) 1200} \\ \underline{960} \\ 240 \end{array}$$

3. If 8 men can be carried in 10 days what is the case of 10 men at the same rate

$$\begin{array}{r} 125 \\ 8 \overline{) 1000} \\ \underline{640} \\ 360 \end{array}$$

4. If 8 students spend 100 \$ in 6 months how much will 12 students spend in 10 months

$$\begin{array}{r} 125 \\ 48 \overline{) 1200} \\ \underline{960} \\ 240 \end{array}$$

1. If 10 horses will serve 15 horses for 20 days how many bushels will serve 30 horses for 20 days

$$\begin{array}{r} 150 \\ 30 \overline{) 4500} \\ \underline{3000} \\ 1500 \end{array}$$

5. If 2000 weight is carried 30 miles for 25 miles how much must be paid for the carriage of 1000 weight 100 miles

$$\begin{array}{r} 1000 \\ 25 \overline{) 25000} \\ \underline{25000} \\ 0 \end{array}$$

2. If 100 bushels of bread will feed 100 men for 10 days how much bread will feed 200 men for 20 days

$$\begin{array}{r} 200 \\ 10 \overline{) 4000} \\ \underline{4000} \\ 0 \end{array}$$

Double Rule Pf

6 If interest is paid
by 100 in 12 months how
what will be the interest
of 100 in 4 years

$$\begin{array}{r} 700 \\ 1000 \end{array} \begin{array}{r} 111 \\ 7 \end{array} \begin{array}{r} 10000 \\ 10000 \end{array}$$

$$\begin{array}{r} 21000 \\ 21000 \\ 90000 \\ 21000 \\ 11200 \end{array} \begin{array}{r} 33600 \\ 336 \end{array} \begin{array}{r} 10000 \\ 10000 \end{array}$$

6 If 1 man can reap 8 acres
of grain in 12 Days how many
men can reap 1000 in 12

$$\begin{array}{r} 840 \\ 1000 \end{array} \begin{array}{r} 12 \\ 12 \end{array} \begin{array}{r} 1000 \\ 1000 \end{array}$$

$$\begin{array}{r} 1680 \\ 1680 \end{array} \begin{array}{r} 12 \\ 12 \end{array} \begin{array}{r} 1000 \\ 1000 \end{array}$$

6 If no etc are paid for
the carriage of 200 lbs from
miles how far may 2000
etc be carried for 60 \$ 60

$$\begin{array}{r} 2000 \\ 2000 \end{array} \begin{array}{r} 40 \\ 40 \end{array} \begin{array}{r} 2000 \\ 2000 \end{array}$$

7

10 men can do 12 rods
of ditching in 10 how
many rods of ditching may
be done by 8 men in

$$\begin{array}{r} 12 \\ 12 \end{array} \begin{array}{r} 10 \\ 10 \end{array} \begin{array}{r} 10 \\ 10 \end{array}$$

$$\begin{array}{r} 2000 \\ 2000 \end{array} \begin{array}{r} 10 \\ 10 \end{array} \begin{array}{r} 10 \\ 10 \end{array}$$

7

5 men spend 200 \$ in 22
weeks and 6 days how long
will 300 \$ support 12 men

$$\begin{array}{r} 200 \\ 200 \end{array} \begin{array}{r} 22 \\ 22 \end{array} \begin{array}{r} 200 \\ 200 \end{array}$$

$$\begin{array}{r} 2100 \\ 2100 \end{array} \begin{array}{r} 24 \\ 24 \end{array} \begin{array}{r} 2400 \\ 2400 \end{array}$$

8

14 men are paid
100 \$ for 3 Days work
how many men can
reap 1000 acres

$$\begin{array}{r} 100 \\ 100 \end{array} \begin{array}{r} 3 \\ 3 \end{array} \begin{array}{r} 1000 \\ 1000 \end{array}$$

$$\begin{array}{r} 384 \\ 384 \end{array} \begin{array}{r} 12 \\ 12 \end{array} \begin{array}{r} 1000 \\ 1000 \end{array}$$

9

12 men in 8 cut 1000
acres how many acres will
serve 24 men in 8 Days

$$\begin{array}{r} 1000 \\ 1000 \end{array} \begin{array}{r} 8 \\ 8 \end{array} \begin{array}{r} 24 \\ 24 \end{array}$$

$$\begin{array}{r} 96 \\ 96 \end{array} \begin{array}{r} 12 \\ 12 \end{array} \begin{array}{r} 1000 \\ 1000 \end{array}$$

Practice Continued By R. H. C.

Case First

When the price consists of dollars etc and millos & Pence the given quantity by multi

as in whole numbers and point off from the right of ~~from the~~ millos and etc according to the rules of ~~money~~ or multiply by 8 only and take aliquot parts for the etc and millos

$$\begin{array}{r} 25 \overline{) 504250} \\ 25 \overline{) 250} \\ 125 \\ 625 \\ 156250 \end{array}$$

$$\begin{array}{r} 20 \overline{) 201} \\ 20 \overline{) 200} \\ 10 \\ 2210 \\ 221 \\ 243100 \end{array}$$

$$5 \overline{) 1016750} \text{ at } 201.5$$

$$10 \overline{) 1016750} \text{ at } 201.5$$

$$20 \overline{) 2016750} \text{ at } 201.5$$

$$40 \overline{) 4033500} \text{ at } 201.5$$

$$80 \overline{) 8067000} \text{ at } 201.5$$

$$160 \overline{) 16134000} \text{ at } 201.5$$

When the price is a fractional the vessell cost part of a cent such as 3 thirds of a cent multiply by the quantity by the numerator and divide the product by the denominator the quotient will be the ans

$$2 \overline{) 4 \frac{1}{2}} = 2 \frac{1}{4} \text{ at } \frac{1}{4} \text{ of ad of car}$$

$$\begin{array}{r} 17 \\ 2 \\ 490 \\ 1175 \\ 12250 \end{array}$$

$$\begin{array}{r} 12 \overline{) 1478} \\ 24 \\ 80 \\ 28 \\ 1478 \\ 2 \\ 312826 \end{array}$$

$$\begin{array}{r} 912 \\ 14 \overline{) 128} \\ 28 \\ 58 \\ 28 \\ 1481 \end{array}$$

$$\begin{array}{r} 116 \\ 54 \overline{) 631} \\ 3242 \\ 7 \\ 8122854 \\ 285425 \end{array}$$

1 Bought a hoghead of tobacco each weighing 125 cwt at 8 1/2 per cwt what did it cost 125

$$\begin{array}{r} 786 \\ 11 \\ 3058 \\ 21000 \\ 600 \\ 84000 \\ 8125000 \\ 3150 \end{array}$$

2 A gentle man bought a vessell of 80 ton burden and gave at the rate of 2 1/2 eagles per ton what did

$$\begin{array}{r} 60 \\ 2 \\ 120 \\ 36 \\ 65 \\ 1576 \\ 585 \\ 36 \end{array}$$

Practice Continued

3 Carpenter bought 1000 feet of boards at 178 1/2 a thousand what did they cost him.

$$\begin{array}{r} 125 \\ 178 \frac{1}{2} \\ \hline 178500 \\ 31500 \end{array}$$

Case 2 and

When the price and quantity given are of several denominations multiply the price by the integers or whole number and take aliquot parts for the rest

Bought 12 cut 1 lb of tobacco at 128 1/2 cts per cut weight what did it cost

$$\begin{array}{r} 128 \frac{1}{2} \\ 12 \\ \hline 1544 \\ 12850 \\ \hline 16135 \end{array}$$

12 cut 3 lb of sugar at 108 1/2 cts per cut weight

$$\begin{array}{r} 108 \frac{1}{2} \\ 12 \\ \hline 1302 \\ 10850 \\ \hline 130200 \\ 130200 \end{array}$$

3 cut 1 lb of tobacco at 138 1/2 cts per cut weight

$$\begin{array}{r} 138 \frac{1}{2} \\ 3 \\ \hline 415500 \\ 415500 \end{array}$$

Case 4

When the price consists of shillings, pence and farthings reduce the price to a single denomination of money (pence or farthings) and then divide according to the preceding case or multiply by the integers and take aliquot parts for the remainder

$$\begin{array}{r} 6 \text{ shillings } 10 \text{ pence } 8 \text{ farthings} \\ 6 \\ \hline 1000000 \\ 1000000 \end{array}$$

$$\begin{array}{r} 324 \text{ at } 20 \\ 66-3-4 \\ \hline 1324 \\ 215800 \\ \hline 17665 \end{array}$$

21

Practice Continued

3. 5 lbs of sugar
at 5x10 110 5 2 per cent

| | | |
|----|-----|-----|
| 10 | 110 | 110 |
| 1 | 11 | 11 |
| 2 | 22 | 22 |
| 3 | 33 | 33 |
| 4 | 44 | 44 |
| 5 | 55 | 55 |
| 6 | 66 | 66 |
| 7 | 77 | 77 |
| 8 | 88 | 88 |
| 9 | 99 | 99 |
| 10 | 110 | 110 |

4. 1 lb of rice at 2 10 2 1/2 per cent

| | | |
|----|-----|-----|
| 10 | 210 | 210 |
| 1 | 21 | 21 |
| 2 | 42 | 42 |
| 3 | 63 | 63 |
| 4 | 84 | 84 |
| 5 | 105 | 105 |
| 6 | 126 | 126 |
| 7 | 147 | 147 |
| 8 | 168 | 168 |
| 9 | 189 | 189 |
| 10 | 210 | 210 |

5. 1 lb of rice at 18 5 1/2 per cent

| | | |
|----|-----|-----|
| 10 | 185 | 185 |
| 1 | 18 | 18 |
| 2 | 36 | 36 |
| 3 | 54 | 54 |
| 4 | 72 | 72 |
| 5 | 90 | 90 |
| 6 | 108 | 108 |
| 7 | 126 | 126 |
| 8 | 144 | 144 |
| 9 | 162 | 162 |
| 10 | 180 | 180 |

6. 1 lb of rice at 11 1/2 per cent

| | | |
|----|-----|-----|
| 10 | 111 | 111 |
| 1 | 11 | 11 |
| 2 | 22 | 22 |
| 3 | 33 | 33 |
| 4 | 44 | 44 |
| 5 | 55 | 55 |
| 6 | 66 | 66 |
| 7 | 77 | 77 |
| 8 | 88 | 88 |
| 9 | 99 | 99 |
| 10 | 110 | 110 |

1 lb of rice at 18 5 1/2 per cent

| | | |
|----|-----|-----|
| 10 | 185 | 185 |
| 1 | 18 | 18 |
| 2 | 36 | 36 |
| 3 | 54 | 54 |
| 4 | 72 | 72 |
| 5 | 90 | 90 |
| 6 | 108 | 108 |
| 7 | 126 | 126 |
| 8 | 144 | 144 |
| 9 | 162 | 162 |
| 10 | 180 | 180 |

2. 1 lb of rice at 18 5 1/2 per cent

| | | |
|----|-----|-----|
| 10 | 370 | 370 |
| 1 | 37 | 37 |
| 2 | 74 | 74 |
| 3 | 111 | 111 |
| 4 | 148 | 148 |
| 5 | 185 | 185 |
| 6 | 222 | 222 |
| 7 | 259 | 259 |
| 8 | 296 | 296 |
| 9 | 333 | 333 |
| 10 | 370 | 370 |

3. 1 lb of rice at 18 5 1/2 per cent

| | | |
|----|-----|-----|
| 10 | 555 | 555 |
| 1 | 55 | 55 |
| 2 | 110 | 110 |
| 3 | 165 | 165 |
| 4 | 220 | 220 |
| 5 | 275 | 275 |
| 6 | 330 | 330 |
| 7 | 385 | 385 |
| 8 | 440 | 440 |
| 9 | 495 | 495 |
| 10 | 550 | 550 |

4. 1 lb of rice at 18 5 1/2 per cent

| | | |
|----|-----|-----|
| 10 | 740 | 740 |
| 1 | 74 | 74 |
| 2 | 148 | 148 |
| 3 | 222 | 222 |
| 4 | 296 | 296 |
| 5 | 370 | 370 |
| 6 | 444 | 444 |
| 7 | 518 | 518 |
| 8 | 592 | 592 |
| 9 | 666 | 666 |
| 10 | 740 | 740 |

5. 1 lb of rice at 18 5 1/2 per cent

| | | |
|----|-----|-----|
| 10 | 925 | 925 |
| 1 | 92 | 92 |
| 2 | 184 | 184 |
| 3 | 276 | 276 |
| 4 | 368 | 368 |
| 5 | 460 | 460 |
| 6 | 552 | 552 |
| 7 | 644 | 644 |
| 8 | 736 | 736 |
| 9 | 828 | 828 |
| 10 | 920 | 920 |

Simple Interest Continues

11 What is the interest of $\text{£}1520$ for 1 year at 6 per cent

$\text{£}1520$
 27240

12 Required the interest is the same sum for 5 years at the same rate

$\text{£}1520$
 27240

13 Required the amount of the same sum for 5 years at the same rate

$\text{£}1520$
 27240

$\text{£}13520$ interest
 $\text{£}15200$ principal
 $\text{£}28720$ Amount

14 What is the interest of $\text{£}2000$ for 2 years at 6 per cent

$\text{£}2000$
 24000

15 What is the interest of $\text{£}1080$ for 1 year at 7 per cent

$\text{£}1080$
 12600
 8820
 2400

16 What is the amount of $\text{£}2000$ for 1 year at 7 per cent

$\text{£}2000$
 5600
 4480
 13440
 56000
 27440

17 What sum must be given to discharge a bond given for $\text{£}1520$ on which there is 6 months interest at 6 per cent

$\text{£}1520$
 22600
 135600
 $\text{£}152000$
 $\text{£}87600$

18 What is the amount of $\text{£}400$ for 2 years at 6 per cent

$\text{£}400$
 24000
 200
 26000
 5200
 $\text{£}400$
 $\text{£}45200$

19 What is the interest of $\text{£}4925$ for 9 years at $7\frac{1}{2}$ per cent

$\text{£}4925$
 369375
 24625
 369375
 8
 3324345

20 What is the amount of $\text{£}2500$ for 1 year at $7\frac{1}{2}$ per cent

$\text{£}2500$
 187500
 12500
 14500
 14500
 1937500
 2500
 26937500

Simple Interest By Wm H. Moore H. C. H.

Case

W. H. C. A. S. E. B. W. H. M.

1 What is the interest of 2648 50 cts for 1 year at 6 per cent

$$\begin{array}{r} 264850 \\ \times 6 \\ \hline 158900 \end{array}$$

What is the interest of 100 \$ for 8 months at 6 per cent per annum

$$\begin{array}{r} 100 \\ \times 6 \\ \hline 600 \\ \div 12 \\ \hline 50 \end{array}$$

2 What is the interest of 4689 22 cts and 5 mills for 1 year at 9 per cent

$$\begin{array}{r} 468922 \\ \times 9 \\ \hline 4220298 \end{array}$$

What is the interest of 500 \$ for 1 year and 6 months at 6 per cent per annum

$$\begin{array}{r} 500 \\ \times 6 \\ \hline 3000 \\ \div 12 \\ \hline 250 \end{array}$$

3 What is the interest of 100 \$ for 8 years at 6 per cent per annum

$$\begin{array}{r} 100 \\ \times 6 \\ \hline 600 \\ \div 12 \\ \hline 50 \end{array}$$

What is the interest of 100 \$ for 9 months at 6 per cent per annum

$$\begin{array}{r} 100 \\ \times 6 \\ \hline 600 \\ \div 12 \\ \hline 50 \end{array}$$

What is the amount of a note for 100 \$ with 8 months interest at 6 per cent per annum

$$\begin{array}{r} 100 \\ \times 6 \\ \hline 600 \\ \div 12 \\ \hline 50 \\ + 100 \\ \hline 150 \end{array}$$

What is the amount of a note for 100 \$ with 12 months interest at 6 per cent per annum

$$\begin{array}{r} 100 \\ \times 6 \\ \hline 600 \\ \div 12 \\ \hline 50 \\ + 100 \\ \hline 150 \end{array}$$

What sum will discharge a bond for 100 \$ with 8 months interest at 6 per cent per annum

$$\begin{array}{r} 100 \\ \times 6 \\ \hline 600 \\ \div 12 \\ \hline 50 \\ + 100 \\ \hline 150 \end{array}$$

5 What is the interest of 100 \$ for 12 months at 6 per cent per annum

$$\begin{array}{r} 100 \\ \times 6 \\ \hline 600 \\ \div 12 \\ \hline 50 \\ + 100 \\ \hline 150 \end{array}$$

6 What is the interest of 100 \$ for 12 months at 6 per cent

$$\begin{array}{r} 100 \\ \times 6 \\ \hline 600 \\ \div 12 \\ \hline 50 \\ + 100 \\ \hline 150 \end{array}$$

Simple Interest

What is the interest on \$1000 for 12 days at 7 per cent per annum.

1000 principal
7 per cent
12 days

1000
7
12
100

What is the interest on \$1000 for 12 days at 7 per cent per annum.

1000 principal
7 per cent
12 days

1000
7
12
100

Ans \$1.12

What is the interest on \$1000 for 12 days at 7 per cent per annum.

1000 principal
7 per cent
12 days

1000
7
12
100

What is the interest on \$1000 for 12 days at 7 per cent per annum.

1000 principal
7 per cent
12 days

1000
7
12
100

What is the interest on \$1000 for 12 days at 7 per cent per annum.

1000 principal
7 per cent
12 days

1000
7
12
100

What is the interest on \$1000 for 12 days at 7 per cent per annum.

1000 principal
7 per cent
12 days

1000
7
12
100

Ans \$1.12

246219 254160

118487
1481075

372438

608375239226 (122888)

14408
12168

48248
36498

53748
48664

50820
48664

2156

12

180281733921192

246784
1873399

608317686494 (2995)

12164

58204
54747

45794
42181

32136
30415

1715

CASE 5

What is principal being put to interest for 12 years at 6 per cent per annum will amount to

27528 72

172110012752

17212752 (16)

Received 7280 as payment in full for a note with 5 years interest thereon at 6 per cent per annum for

how much is the note given

7280

18500 100:1728

1300 1728000:16000

7800

итино

10

10

10

[illegible]

—

This is a blank, aged, cream-colored page, likely an endpaper or flyleaf of a book. The paper has a slightly textured appearance with some minor discoloration and faint smudges, characteristic of old paper. The left edge shows the binding of the book.

17

11

Mar 1891

6

213

is term

5
11

25

10

1 Insurance and Commission

1 What is the commission on 1200

$$\begin{array}{r} 1200 \\ \times 6\% \\ \hline 7200 \end{array}$$

$$\begin{array}{r} 1200 \\ \times 3\% \\ \hline 3600 \end{array}$$

$$\begin{array}{r} 1200 \\ \times 3\% \\ \hline 3600 \end{array}$$

$$\begin{array}{r} 1200 \\ \times 3\% \\ \hline 3600 \end{array}$$

2 What is the commission on 1200

$$\begin{array}{r} 1200 \\ \times 6\% \\ \hline 7200 \end{array}$$

$$\begin{array}{r} 2554 \text{ at } 3\% \\ \hline 7662 \end{array}$$

$$\begin{array}{r} 26342 \text{ at } 3\% \\ \hline 79026 \end{array}$$

$$\begin{array}{r} 6421 \text{ at } 3\% \\ \hline 19263 \end{array}$$

$$\begin{array}{r} 19263 \\ \hline 8182 \text{ Ans} \end{array}$$

7 A commission merchant has received 4120 g with instructions to vest it in salt at 8 per cent his commission of 3 per cent how many bbls of salt can he purchase

$$\begin{array}{r} 4120 \\ \times 8\% \\ \hline 329600 \end{array}$$

1 What is the brokerage of 1625 at 5 per cent

$$\begin{array}{r} 1625 \\ \times 5\% \\ \hline 81250 \end{array}$$

$$\begin{array}{r} 1848 \text{ at } 21\% \text{ per cent} \\ \hline 38808 \end{array}$$

$$\begin{array}{r} 560 \text{ at } 6\% \text{ per cent} \\ \hline 3360 \text{ Ans} \end{array}$$

4 What sum must be taken out for to cover 1000 when the premium is 10 per cent

$$\begin{array}{r} 1000 \\ \times 10\% \\ \hline 100000 \end{array}$$

5 What sum will it require per bbl deducting from it to cover a policy of insurance for 1000 at 8 per cent

$$\begin{array}{r} 1000 \\ \times 8\% \\ \hline 80000 \end{array}$$

6 What sum will it require to cover a policy of insurance for 1000 at 8 per cent

$$\begin{array}{r} 1000 \\ \times 8\% \\ \hline 80000 \end{array}$$

100

Beater Or Discount By m.

$$\begin{array}{r} 1 \quad 1576 \\ 1576 \\ 1576 \\ \hline 1687 \end{array}$$

$$\begin{array}{r} 3 \quad 1686 \\ 1686 \\ 1686 \\ 1686 \\ \hline 1686 \end{array}$$

$$\begin{array}{r} 4 \quad 25000 \\ 25000 \\ 25000 \\ 25000 \\ \hline 25000 \end{array}$$

$$\begin{array}{r} 5 \quad 12840 \\ 12840 \\ 12840 \\ \hline 12840 \end{array}$$

$$\begin{array}{r} 6 \quad 9284 \\ 9284 \\ 9284 \\ 9284 \\ \hline 9284 \end{array}$$

$$\begin{array}{r} 7 \quad 1518 \\ 1518 \\ 1518 \\ 1518 \\ \hline 1518 \end{array}$$

RULE

1 What is the present worth of 21.00 \$ due 1 year and 6 months hence discounting at the rate of 8 per cent per annum

$$\begin{array}{r} 100 \\ 112 \\ \hline 112 : 100 :: 21.00 \\ 112 \overline{) 246400} \\ \underline{224} \\ 224 \\ \underline{224} \\ 00 \end{array}$$

3 It has Bs note for 1854.80 etc payable 8 months after date what is the present worth of said note discounting at the rate 5 1/2 per cent

$$\begin{array}{r} 12 \overline{) 44} \\ 36666 \\ 1036666 : 100 : 1854.80 \\ 1036666 \overline{) 1854800} \\ 8356662 \\ 9518480 \\ 9329794 \\ \hline 1864860 \\ 1036666 \\ \hline 8312648 \\ 112228 \end{array}$$

4 What is the discount reduction must be made for prompt payment of a note for 850 \$ due 2 years hence 11 per cent per annum being allowed for discount

$$\begin{array}{r} 12 \overline{) 168} \\ 14 \\ 114 : 100 :: 850 \\ 114 \overline{) 85000} \\ 570 \\ 570 \\ \hline 85000 \\ 57012 \\ \hline 49988 \end{array}$$

Equation of Payments

Suppose a Merchant bought for 1000 dollars to be paid in 12 months but he has paid in 3 months 400 dollars and he has 600 dollars left to be paid in 9 months. Now he wants to know what he should pay in 6 months so that he may be paid in 6 months.

In this case the time of payment

1000 dollars at 12 months
400 dollars at 3 months
600 dollars at 9 months

1000 dollars at 12 months
400 dollars at 3 months
600 dollars at 9 months
1000 dollars at 12 months
400 dollars at 3 months
600 dollars at 9 months

Now if we divide 1000 by 12 we get 83.33 dollars at 12 months
400 divided by 3 is 133.33 dollars at 3 months
600 divided by 9 is 66.66 dollars at 9 months
and in equation of payments
a discount is given upon what must
be paid at once

1000 dollars at 12 months
400 dollars at 3 months
600 dollars at 9 months
1000 dollars at 12 months
400 dollars at 3 months
600 dollars at 9 months
1000 dollars at 12 months
400 dollars at 3 months
600 dollars at 9 months

W. RULE

3 A bankrupt is indebted
to A 2118 20cts to B 5000
30cts to C 4013 40cts to
D 2285 and his estate
is worth but 2048 95cts
how much does he pay per
cent and how much is each
creditor to receive

11 75 762 95
548 800
271 695 0
1910 300

и Левин

Deed

34 Wm. 36.

2710.22 204675:7094

7740
 318700
 1841075
 1113185
 1701185 1741111 700 (531.910) 16
 1361150
 87116 11
 8187 0
 800 1811
 365 800
 1361150
 1311150
 11111

272700:204675:1228

228
 1637400
 1109350
 1109350
 2711911665 700 (1710) 16
 1777
 11375
 17103
 2774
 1228

At the man of Band C
 Rent a farm 588 of 2000
 at 1 dollar per year
 which a pays 8 1/2 years and
 2288 and they agree that
 the farm shall be divided
 in proportion to the rents

180 A R P
 228
 600:588 1 20 2180
 2311
 400
 937111
 180
 5697120
 937111
 600 686581 1125111
 110
 1186
 400
 15
 60
 252
 140
 110
 1220

100:588 2 311:195

23112
 937114
 195
 1108590
 8151111
 937114 (10)
 600 18274230 (3045) 2
 180 1761 17
 2711
 2110
 3112
 300
 123
 112
 3 3 10
 3 6 20

600:588 2 311:225

23112
 1100
 937114
 225
 1108590
 1871178
 1871178
 600 1085650 (4351112)
 180 14578 12
 308 215 7 0.18880
 300 (Dr)
 85
 65
 256
 2405
 120
 157 45 2
 60 6

The Fellowship

Three merchants freighted a ship with barrels of powder of which 900 lb. belonged to A and the rest to B but on account of stormy weather they were obliged to throw 900 lbs. overboard how many lbs. did each man lose

$$\begin{array}{r} 900 \\ 720 \\ \hline 180 \end{array}$$

$$2100:900:900$$

$$2100 \overline{) 810000} \begin{array}{l} 385 \\ 8100 \end{array}$$

$$2100:900:720$$

$$2100 \overline{) 6118000} \begin{array}{l} 2913 \\ 6118 \end{array}$$

$$2100:900:1180$$

$$2100 \overline{) 1182000} \begin{array}{l} 563 \\ 1182 \end{array}$$

Three merchants join stock in trade & put in 8000 and to a certain sum and they gained in 8 years time 8255 of which C took his part 2558 required A and B's part of the gain and how much stock C put in

$$\begin{array}{r} 8255 \\ 295 \\ \hline 8550 \end{array}$$

$$2100 \overline{) 1693000} \begin{array}{l} 799 \\ 63000 \\ 63000 \end{array}$$

$$2100:900:800$$

$$2100 \overline{) 1182000} \begin{array}{l} 563 \\ 1182 \end{array}$$

$$990:2100:275$$

$$550 \overline{) 577500} \begin{array}{l} 1050 \\ 550 \end{array}$$

7 men trade with a stock of 8000 and they gained in 10 years time as much & and how much of the stock was required & how much each gained

$$\begin{array}{r} 8000 \\ 8000 \\ \hline 16000 \end{array}$$

$$8000 \overline{) 1276000} \begin{array}{l} 1595 \\ 12760 \end{array}$$

$$8000:16000:3000$$

$$7840$$

$$8000 \overline{) 1182000} \begin{array}{l} 14775 \\ 118200 \end{array}$$

$$8000:16000:3000$$

$$8000 \overline{) 492000} \begin{array}{l} 615 \\ 615 \end{array}$$

$$8000:16000:1000$$

$$8000 \overline{) 164000} \begin{array}{l} 205 \\ 16000 \end{array}$$

Compound Fellowship

RULE WHEN MCO

Three merchants enter into partnership on the first of April a sum for 10 months A put into stock at first 1000 £ and at the end of 8 months put in 200 £ more B put in at first 200 £ at the end of 10 was obliged to take out 600 £ C put in at first 100 £ and at the end of 10 months put in 800 £ more with this stock they gained 2300 £ what is each man's share

$$\begin{array}{r}
 6000 \times 8 = 48000 \\
 2000 \times 8 = 16000 \\
 \hline
 64000 \\
 1700 \times 10 = 17000 \\
 2000 \times 10 = 20000 \\
 \hline
 37000 \\
 10000 \times 10 = 100000 \\
 18000 \times 10 = 180000 \\
 \hline
 290000 \\
 11200 \\
 18000 \\
 19200 \\
 \hline
 46000 : 23000 : 112000 \\
 \hline
 380000 \quad (A) \\
 224000 \quad (B) \\
 146000 \quad (C) \\
 \hline
 750000 \\
 2300 \\
 \hline
 752300 \\
 2300 \\
 \hline
 754600 \\
 46000 : 23000 : 112000 \\
 \hline
 468000 \\
 31200 \\
 \hline
 46000 : 358800 : 780000 \quad (A) \\
 31200 \\
 \hline
 36800 \\
 36800 \\
 \hline
 46000 : 23000 : 192000 \\
 \hline
 596000 \\
 381000 \\
 \hline
 40000 : 78000 : 192000 \quad (B) \\
 41400 \\
 \hline
 24600 \\
 24600 \\
 \hline
 0
 \end{array}$$

3. A and B join stock in trade A put in 1000 £ on the first January B advances which entitled him to an equal share of the profit at the end of the year required the sum C put in

$$\begin{array}{r}
 1000 \\
 1000 \\
 \hline
 2000 \\
 2000 \\
 \hline
 4000 : 12 \\
 91200 \\
 800000 \\
 \hline
 891200
 \end{array}$$

4. A put in stock 1800 £ at the end of 10 months he advanced such a sum at the end of the year will entitle him to an equal of the profit at the end of the year required the sum C put in

$$\begin{array}{r}
 1800 \\
 1800 \\
 \hline
 3600 \\
 3600 \\
 \hline
 7200 : 12 \\
 81200 \\
 2700000 \\
 \hline
 2781200
 \end{array}$$

5. Two gentlemen A and B hired a carriage to go to Philadelphia and return for 100 £ with liberty to take in two by the way when at Philadelphia they took in D and afterwards 100 miles from Philadelphia they took in E now allowing it to be 300 miles from Philadelphia to Pittsburgh and also that each man pay in proportion

Profit And RULE

2 Bought a piece of cloth for 18 and 20cts per yard and sold it again for 18 50cts again what is the gain percent

$$\begin{array}{r} 180 \\ 120 \overline{) 3000} \text{ (20 cts)} \\ \underline{240} \\ 600 \end{array}$$

3 Bought a piece of skin containing 42 yds for 218 and sold it at 62cts per yd what is the gain or loss of the whole piece

$$\begin{array}{r} 218 \\ 42 \overline{) 2592} \\ \underline{210} \\ 492 \text{ gain} \end{array}$$

4 A merchant bought 8 barrels of whiskey containing 32 gallons each for 908 while in his possession he lost 12 galls. in leakage the residue he sold for such a sum as gained him 128 on the whole how much per gallon did he buy and sell

$$\begin{array}{r} 32 \\ 6 \overline{) 192} \\ \underline{192} \\ 960 \end{array}$$

$$\begin{array}{r} 192 \\ 12 \overline{) 1800} \\ \underline{1800} \\ 960 \end{array}$$

$$\begin{array}{r} 180 \\ 1080 \overline{) 11880} \text{ (60 gain)} \\ \underline{1080} \\ 1080 \end{array}$$

Loss

B 120 dozen of off knives for 20cts a piece and sold the again for 17cts each what was the loss on the whole

$$\begin{array}{r} 172 \\ 131 \overline{) 443} \\ \underline{432} \\ 11 \end{array}$$

1 Bought a piece of cloth at 18 50cts per yd and sold it at 18 50cts per yd what is the gain or loss

$$\begin{array}{r} 18 \\ 18 \overline{) 18} \\ \underline{18} \\ 0 \end{array}$$

5 A merchant bought 10 barrels of whiskey containing 40 gallons each for 1000 while in his possession he lost 10 galls. in leakage the residue he sold for such a sum as gained him 100 on the whole how much per gallon did he buy and sell

$$\begin{array}{r} 100 \\ 10 \overline{) 1000} \\ \underline{1000} \\ 0 \end{array}$$

Profit and Loss

9 A trader bought a barrel of rum of a certain price containing 115 gallons. It sold for 10 cents per gallon. How many gallons of water must he add to it to gain 5 dollars by selling it at 10 cents per gallon? Thus 115 gallons

$$\begin{array}{r} 115 \\ 10 \overline{) 1150} \\ \underline{115} \\ 0 \end{array}$$

10 A merchant bought a barrel of rum at 10 cents per gallon. He sold it at 12 cents per gallon. How many gallons of water must he add to it to gain 5 dollars by selling it at 12 cents per gallon?

$$\begin{array}{r} 115 \\ 12 \overline{) 1150} \\ \underline{114} \\ 10 \end{array}$$

11 A merchant bought a barrel of rum at 10 cents per gallon. He sold it at 12 cents per gallon. How many gallons of water must he add to it to gain 5 dollars by selling it at 12 cents per gallon?

$$\begin{array}{r} 115 \\ 12 \overline{) 1150} \\ \underline{114} \\ 10 \end{array}$$

12 A trader laid out 1000 dollars in cloth at 2 dollars per yard. He sold it at 2.50 dollars per yard. How much profit did he make?

$$\begin{array}{r} 1000 \\ 2.50 \overline{) 1000.00} \\ \underline{500.00} \\ 500.00 \end{array}$$

13 A trader bought a quantity of wheat at 18 per bushel and gained 20 percent shortly afterwards he sold off the same to the same person at 22 per bushel. How many bushels were there in the last parcel and at what rate did he sell it?

$$\begin{array}{r} 115 \\ 12 \overline{) 1150} \\ \underline{114} \\ 10 \end{array}$$

$$\begin{array}{r} 115 \\ 12 \overline{) 1150} \\ \underline{114} \\ 10 \end{array}$$

$$\begin{array}{r} 115 \\ 12 \overline{) 1150} \\ \underline{114} \\ 10 \end{array}$$

Exchange

1. A and B. A has money that cost him 20¢ per lb. B has money that cost him 25¢ per lb. A sent him 20 lbs per year at what price must he put it to gain 10 per cent.

$$\begin{array}{r} 22.50 \\ 25 \\ \hline 11.25 \\ 22.50 \\ \hline 22.50 \end{array}$$

$$22.50 \times 1.10 = 24.75$$

$$\begin{array}{r} 100 \\ 11 \\ \hline 110 \\ 22.50 \\ \hline 24.75 \end{array}$$

$$110 \div 1.10 = 100$$

$$100 \div 1.10 = 90.91$$

$$100 \div 1.10 = 90.91$$

2. A buys 25 bbls of flour from B at 80¢ per lb. in payment B takes 100 lb of coffee at 90¢ per lb. 60 lb of tea at 12¢ per lb. 25 yds of broad cloth at 80¢ per yd. 200 lb of salt in cash the rest in salt at 80¢ per lb. how many bbls of salt must B receive.

| | | |
|--------|--------|--------|
| 1.25 | 25.00 | 31.25 |
| 25.00 | 25.00 | 50.00 |
| 31.25 | 12.80 | 44.05 |
| 12.50 | 32.00 | 44.50 |
| 154.25 | 55.00 | 209.25 |
| 60.25 | 1.34 | 61.59 |
| 91.00 | 1.42 | 92.42 |
| | 15.00 | 107.42 |
| | 206.10 | 313.52 |
| | 602.50 | 916.02 |

Exchange

2. What is the value of 250 lb new york currency in pennsylvania.

$$\begin{array}{r} 8.75 \\ 12.12 \\ \hline 96.90 \end{array}$$

$$\begin{array}{r} 512.00 \\ 12 \\ \hline 6144.00 \\ 90 \\ \hline 96 \overline{) 5529600} \end{array}$$

$$\begin{array}{r} 480 \\ 728 \\ 672 \\ \hline 596 \\ 576 \\ \hline 20 \end{array}$$

$$\begin{array}{r} 57600 \\ 20 \overline{) 4800} \\ \hline 240 \end{array}$$

3. How much south carolina is equal to 150 lb of new jersey.

$$\begin{array}{r} 8.25 \\ 12 \\ \hline 96 \end{array}$$

$$\begin{array}{r} 30000 \\ 12 \\ \hline 360000 \\ 56 \\ \hline 2160000 \\ 180000 \\ \hline 96 \overline{) 20160000} \end{array}$$

$$\begin{array}{r} 121224000 \\ 20 \overline{) 18655} \\ \hline 933 = 6 \text{ } 25 \text{ } 000 \end{array}$$

4. What sum new york currency is equal to 150 lb in massachusetts.

$$\begin{array}{r} 7.61 \\ 12 \\ \hline 96 \end{array}$$

$$\begin{array}{r} 3600 \\ 12 \\ \hline 43200 \\ 96 \overline{) 259200} \end{array}$$

$$\begin{array}{r} 1212886 \\ 240 \end{array}$$

Exchange Continued

1. A bill of exchange
How much Virginia currency
will purchase a bill for 2800
South Carolina

$$\begin{array}{r}
 4-8:6:280 \\
 12 \quad 20 \\
 56 \quad 72 \quad 5600 \\
 \quad \quad 11 \\
 \quad \quad 67200 \\
 \quad \quad 72 \\
 \quad \quad 13140 \\
 \quad \quad 11701400 \\
 56 \quad 1283800 \quad 12861100 \\
 \quad \quad 1118 \quad 121200 \\
 \quad \quad \quad 358 \\
 \quad \quad \quad 336 \\
 \quad \quad \quad 214 \\
 \quad \quad \quad 224
 \end{array}$$

6. A bill of exchange being
emitted from Rhode Island
to South Carolina for 3000. What
is its value in the currency of the latter

$$\begin{array}{r}
 6:11:45=811304 \\
 12 \quad 72 \\
 72 \quad 56 \quad 6086 \\
 \quad \quad 12 \\
 \quad \quad 52980 \\
 \quad \quad 56 \\
 \quad \quad 43776 \\
 \quad \quad 364800 \\
 42 \quad 14085760 \quad 1256046 \\
 \quad \quad 360 \quad 2647287104 \\
 \quad \quad 485 \quad 236=811000 \\
 \quad \quad 432 \\
 \quad \quad 537 \\
 \quad \quad 504 \\
 \quad \quad 336 \\
 \quad \quad 288 \\
 \quad \quad 480 \\
 \quad \quad 432 \\
 \quad \quad 48 \\
 \quad \quad 4 \\
 72 \quad 192 \quad 2 \\
 \quad \quad 144 \\
 \quad \quad 48
 \end{array}$$

2. Change 27 10 Pennsylvania currency
to dollars 37 15
26
15 175
15 175
15 175
15 175

Change 225 12 New York currency
to Federal money 225 12
26
854519
5440000

11. A bill of exchange for
1468 lb 19 s. 6 d. Virginia currency
is remitted to Philadelphia.
What is the value in Federal
money 1468 19 6
26
7379
12118750
15637500

5. A sum of 1000 deposited
in the United States branch
bank at Pittsburgh the sum
of 1000 Pennsylvania currency
for what sum may be drawn
for in Federal money

$$\begin{array}{r}
 1000 \\
 76 \\
 15619 \\
 15130020 \\
 2111335 Ans
 \end{array}$$

Foreign Exchange

5 A merchant of Philadelphia receives from his correspondent in Dublin a bill of exchange for 5000 Irish currency what is its value in Federal?

$$\begin{array}{r}
 10000 \\
 10000 : 5000 :: 100 : x \\
 x = 2500
 \end{array}$$

6 A merchant in Philadelphia draws his correspondent in Dublin for the balance of an account amounting 22178 7/8 Irish currency must be remitted to satisfy the draft

$$\begin{array}{r}
 1110 : 1 : 22178 \frac{7}{8} \\
 410 : 2 : 22178 \frac{7}{8} \\
 \hline
 1670 \\
 1640 \\
 \hline
 2870 \\
 2080 \\
 \hline
 2050
 \end{array}$$

7 In settlement between A of London and B of Philadelphia B is indebted to A in the sum of 2000 sterling what sum must be remitted by B to A to settle the balance due on 12 percent from the united sum to great Britain.

$$\begin{array}{r}
 10000 \\
 10000 : 5000 :: 100 : x \\
 x = 2500
 \end{array}$$

8 Let 100 years since 3250 \$ to his correspondent in Dublin to be placed to his account for what sum Irish currency must be remitted the course of exchange being 100 cent in parry Ireland

$$\begin{array}{r}
 10000 : 3250 :: 100 : x \\
 x = 3250
 \end{array}$$

Applications

Let grace interest be 10 percent at 100 per 100 what is it for 100

$$\begin{array}{r}
 200000 \\
 30000 \\
 40000 \\
 \hline
 270000
 \end{array}$$

Rich

impro

fra

phi

2/3

frac

2/3

term

Aligations By R. A. C. H.

3 A trader mixed 10 bushels of salt at 15 cts 20 at 160 cts and at 17 cts per bushel at what rate can he afford to sell one bushel of this mixture

$$\begin{array}{r} 10 \times 150 = 1500 \\ 20 \times 160 = 3200 \\ 30 \times 170 = 5100 \\ \hline 6300 \div 30 = 210 \text{ cts} \\ \text{Ans} \end{array}$$

4 9 oz of silver at 120 cts per oz be mixed with 8 oz at 80 cts per oz what is the value of one oz of this mixture

$$\begin{array}{r} 4875 = 320 \\ 800 = 1120 \\ \hline 12875 \div 12 = 1072.91 \text{ cts} \end{array}$$

Case 2 and

How many galls of wine at 35 and 68 per gallon must be mixed together that one gallon may be worth 48

$$\begin{array}{r} 211 = 3 \\ 4 \times 2 = 8 \\ \hline 11 = 1 \end{array}$$

3 How many bushels of rye at 40 cts per bushel and corn at 30 cts must be mixed with 20 cts to make a mixture worth

$$\begin{array}{r} 1575 = 6 \\ 21 \times 40 = 840 \\ \hline 735 = 6 \end{array}$$

4 C. C. grocer has four different sorts of tea viz one kind at 12 cts another at 10 cts another 9 cts and another at 8 cts per lb how much of each sort must be taken to make a mixture worth one dollar per lb

$$\begin{array}{r} 100 \div 120 = 2 \\ 110 \div 110 = 1 \\ 90 \div 90 = 1 \\ 80 \div 80 = 1 \\ \hline 2 = 2 \text{ cts} \end{array}$$

$$\begin{array}{r} 100 \div 120 = 1 \\ 110 \div 110 = 2 \\ 90 \div 90 = 2 \\ 80 \div 80 = 1 \\ \hline 2 = 2 \text{ cts} \end{array}$$

$$\begin{array}{r} 100 \div 120 = 2 \\ 110 \div 110 = 1 \\ 90 \div 90 = 3 \\ 80 \div 80 = 2 \\ \hline 2 = 2 \text{ cts} \end{array}$$

$$\begin{array}{r} 100 \div 120 = 2 \\ 110 \div 110 = 2 \\ 90 \div 90 = 2 \\ 80 \div 80 = 3 \\ \hline 2 = 2 \text{ cts} \end{array}$$

$$\begin{array}{r} 100 \div 120 = 1 \\ 110 \div 110 = 3 \\ 90 \div 90 = 3 \\ 80 \div 80 = 1 \\ \hline 1 = 1 \text{ cts} \end{array}$$

$$\begin{array}{r} 100 \div 120 = 1 \\ 110 \div 110 = 1 \\ 90 \div 90 = 1 \\ 80 \div 80 = 1 \\ \hline 1 = 1 \text{ cts} \end{array}$$

Allegation

2 How much wheat at 18 cts per bush must be mixed with 22 bush of oats at 12 cts per bush and the whole may rate at 22 cts per bush

$$\begin{array}{r} 22 \overline{) 118} \quad 22 \overline{) 118} \\ \underline{44} \quad \underline{44} \\ 74 \quad 74 \end{array}$$

How much wheat at 15 of fine must be mixed together to form a mixture of 40 or 20 carets fine

$$\begin{array}{r} 22 \overline{) 118} \quad 22 \overline{) 118} \\ \underline{44} \quad \underline{44} \\ 74 \quad 74 \end{array}$$

How much sold at 16 20 24 carets fine and how much alloy must be mixed with 18 carets fine that the composition

How many gallons of water must be mixed with wine at 68 per gall to fill a vessel of 40 gall so that it may be sold without loss at 58 per gall

$$\begin{array}{r} 22 \overline{) 118} \quad 22 \overline{) 118} \\ \underline{44} \quad \underline{44} \\ 74 \quad 74 \end{array}$$

$$\begin{array}{r} 5 \overline{) 118} \quad 5 \overline{) 118} \\ \underline{10} \quad \underline{10} \\ 18 \quad 18 \end{array}$$

How much wheat at 15 of fine must be mixed together to form a mixture of 40 or 20 carets fine

Vulgar Fractions By Wm. H. C. H.

Case 1

2. Reduce $\frac{144}{216}$ to its lowest terms
 $72 \overline{) 144} = 2$ Ans

3. Reduce $\frac{75}{125}$ to its lowest terms
 $25 \overline{) 75} = 3$ Ans

4. Reduce $\frac{11800}{10800}$ to its lowest terms
 $12 \overline{) 11800} = 11$ Ans

5. Reduce $\frac{1374}{174}$ to its lowest terms
 $1374 \overline{) 174} = 7$ Ans

6. Reduce $\frac{9876}{88884}$ to its lowest terms
 $9876 \overline{) 9876} = 1$ Ans

Case 2

2. Reduce $12 \frac{1}{3}$ to an improper fraction
 $2 \overline{) 12} = 24$ Ans

3. Reduce $183 \frac{2}{3}$ to an improper fraction
 $183 \frac{2}{3} = \frac{1098}{3} + \frac{4}{3} = \frac{1102}{3}$ Ans

4. Reduce $514 \frac{7}{16}$ to an improper fraction
 $514 \frac{7}{16} = \frac{8224}{16} + \frac{49}{16} = \frac{8273}{16}$ Ans

5. Reduce $68125 \frac{3}{4}$
 $68125 \frac{3}{4} = \frac{272500}{4} + \frac{75}{4} = \frac{272575}{4}$ Ans

Case 3

2. Reduce $3848 \frac{21}{21}$ to its proper fraction
 $3848 \frac{21}{21} = 3848 + 1 = 3849$ Ans

3. Reduce $216 \frac{5}{7}$ to its proper fraction
 $216 \frac{5}{7} = 216 + \frac{10}{7} = 216 \frac{3}{7}$ Ans

4. Reduce $761 \frac{1}{8}$ to its proper fraction
 $761 \frac{1}{8} = 761 + \frac{1}{8} = 761 \frac{1}{8}$ Ans

5. Reduce $8229 \frac{16}{16}$ to its proper term
 $8229 \frac{16}{16} = 8229 + 1 = 8230$ Ans

Reduction of Vulgar Fractions

Case 1th

2nd Reduce $\frac{2}{3}, \frac{4}{5}, \frac{7}{6}$ to a common denominator

$$\begin{array}{r} 3+5+6=90 \\ 4+4+6=96 \\ 5+4+5=100 \\ 6+5+6=120 \end{array}$$

3rd Reduce $\frac{1}{3}, \frac{2}{5}, \frac{3}{6}$ to a common denominator

$$\begin{array}{r} 1+5+6=12 \\ 3+3+6=12 \\ 3+5+6=18 \\ 3+5+6=18 \\ 3+5+6=18 \\ 3+5+6=18 \end{array}$$

Case 5th

2nd Reduce $\frac{2}{3}, \frac{3}{5}, \frac{4}{6}, \frac{5}{12}$ to the least common denominator

$$\begin{array}{r} 12 \times 3 = 36 \\ 12 \times 5 = 60 \\ 12 \times 6 = 72 \\ 12 \times 12 = 144 \end{array}$$

3rd Reduce $\frac{1}{3}, \frac{2}{5}, \frac{3}{6}$ to the least common denominator

$$\begin{array}{r} 3 \times 5 = 15 \\ 5 \times 3 = 15 \\ 6 \times 3 = 18 \\ 15 \times 3 = 45 \\ 15 \times 3 = 45 \\ 15 \times 3 = 45 \end{array}$$

2nd Reduce $\frac{7}{8}$ of $\frac{1}{4}$ of $\frac{9}{10}$ to a single fraction

$$\begin{array}{r} 7 \times 1 \times 9 = 63 \\ 8 \times 4 \times 10 = 320 \end{array}$$

3rd Reduce $\frac{5}{6}$ of $\frac{4}{5}$ of $\frac{3}{4}$ to a single fraction

$$\begin{array}{r} 5 \times 4 \times 3 = 60 \\ 6 \times 5 \times 4 = 120 \end{array}$$

1st Reduce $\frac{5}{6}$ of $\frac{4}{5}$ of $\frac{3}{4}$ to a single fraction

$$\begin{array}{r} 5 \times 4 \times 3 = 60 \\ 6 \times 5 \times 4 = 120 \end{array}$$

Case 7th

1st Reduce $\frac{1}{2}$ of a day to the fraction of a year

$$\begin{array}{r} 1 \times 365 = 365 \\ 2 \times 365 = 730 \end{array}$$

2nd Reduce $\frac{1}{2}$ of a minute to the fraction of a day

$$\begin{array}{r} 10 \times 1440 = 14400 \\ 11 \times 1440 = 15840 \end{array}$$

Vulgar Fractions

By William Hall

Case 8th

2 Reduce $\frac{1}{2}$ of a Troy to the fraction of awt

$$\frac{1 \times 12}{2 \times 1} = \frac{12}{2} = 6 \text{ drms}$$

3 Reduce 125 lb to the fraction of a pt

$$\frac{125 \times 16}{1 \times 1} = 2000 \text{ drms}$$

4 Reduce 1 day to the fraction of a minute

$$\frac{1 \times 24 \times 60}{1 \times 1} = 1440 \text{ mins}$$

Case 9th

2 Reduce $\frac{1}{2}$ of a lb Troy to its proper fraction

$$\frac{1}{2} \times 12 \text{ oz} = 6 \text{ oz}$$

3 Reduce $\frac{1}{4}$ of a mile to its proper quantity

$$\frac{1}{4} \times 4 \text{ fur} = 1 \text{ fur}$$

4 Reduce $\frac{1}{2}$ of a day to its proper time

$$\frac{1}{2} \times 24 \text{ hours} = 12 \text{ hours}$$

5 Rectace What is the value of $\frac{1}{2}$ of a lb

$$\frac{1 \times 16}{2 \times 1} = 8 \text{ drms}$$

Case 10

3 Reduce 31 galls 2 qt to the fraction of a whe

$$\frac{31 \times 4 + 2}{1 \times 1} = 126 \text{ quarts}$$

4 Reduce 6 hundred weight 2 qr 18 lb to the fraction of a ton

$$\frac{6 \times 112 + 2 \times 28 + 18}{2240} = \frac{700}{2240} = \frac{5}{16}$$

Case 11th

2 Reduce $\frac{17}{20}$ to a decimal

$$\frac{17}{20} = 0.85$$

Additional Problems

Case 1

2 Add $\frac{14}{25}, \frac{28}{25}, \frac{13}{25}, \frac{15}{25}, \frac{19}{25}$ together

$$\begin{array}{r} 4 \\ 8 \\ 13 \\ 15 \\ 19 \\ \hline 59 \\ 25 \overline{) 59} \quad 2 \text{ Ans} \\ 50 \\ \hline 9 \\ 25 \overline{) 9} = 2 \\ 5 \overline{) 2} = 1 \end{array}$$

3 Add $\frac{15}{60}, \frac{25}{60}, \frac{45}{60}, \frac{55}{60}$ together

$$\begin{array}{r} 15 \\ 25 \\ 45 \\ 55 \\ \hline 140 \\ 60 \overline{) 140} \quad 2 \text{ Ans} \\ 120 \\ \hline 20 \\ 60 \overline{) 20} = \frac{1}{3} \end{array}$$

Case 2 and

1 Add $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ together

$$\begin{array}{r} 2 \overline{) \frac{1}{2} \frac{1}{3} \frac{1}{4}} \\ 2 \overline{) 1 \frac{2}{3} \frac{1}{2}} \\ 2 \overline{) 1 \frac{2}{3} \frac{1}{2}} \\ 2 \overline{) 1 \frac{2}{3} \frac{1}{2}} \\ 2 \overline{) 1 \frac{2}{3} \frac{1}{2}} \\ 2 \overline{) 1 \frac{2}{3} \frac{1}{2}} \\ 2 \overline{) 1 \frac{2}{3} \frac{1}{2}} \\ 2 \overline{) 1 \frac{2}{3} \frac{1}{2}} \\ 2 \overline{) 1 \frac{2}{3} \frac{1}{2}} \\ 2 \overline{) 1 \frac{2}{3} \frac{1}{2}} \end{array}$$

3 Add $\frac{4}{5}, \frac{5}{6}, \frac{6}{7}, \frac{3}{8}, \frac{8}{15}$ together

$$\begin{array}{r} 4 \quad 5 \quad 6 \quad 3 \quad 8 \\ 5 \overline{) 15} \quad 6 \quad 4 \quad 8 \quad 3 \\ 3 \overline{) 11} \quad 2 \quad 4 \quad 8 \quad 1 \\ 2 \overline{) 11} \quad 1 \quad 7 \quad 4 \quad 1 \end{array}$$

$$\begin{array}{r} 4 \\ 8 \\ 12 \\ 16 \\ 20 \\ \hline 60 \\ 5 \overline{) 60} = 12 \end{array}$$

$$\begin{array}{r} 5 \quad 8 \quad 12 \quad 16 \quad 20 \\ 6 \quad 10 \quad 15 \quad 21 \quad 28 \\ 7 \quad 14 \quad 21 \quad 28 \quad 36 \\ 8 \quad 16 \quad 24 \quad 32 \quad 40 \\ 10 \quad 20 \quad 30 \quad 40 \quad 50 \\ \hline 840 \quad 1280 \quad 1680 \quad 2160 \quad 2800 \\ 2520 \overline{) 840} \quad 3 \text{ Ans} \\ 5 \overline{) 3} = \frac{1}{5} \end{array}$$

Case 3

3 Add $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ of $\frac{1}{2}$ together

$$\begin{array}{r} 1 \quad 2 \quad 3 \\ 2 \quad 3 \quad 4 \\ 3 \quad 4 \quad 6 \\ 4 \quad 6 \quad 12 \\ \hline 12 \quad 12 \quad 12 \\ 12 \overline{) 12} = 1 \text{ Ans} \end{array}$$

Vulgar Fraction By W^d H

4 Add $13 \frac{6}{8}$ $\frac{2}{3}$ of $\frac{1}{2}$ $7 \frac{1}{2}$ together

$$13 \frac{6}{8} \frac{2}{3} \text{ of } \frac{1}{2} 7 \frac{1}{2}$$

$$\begin{array}{r} 13 \frac{6}{8} \\ 2 \frac{1}{2} \\ 7 \frac{1}{2} \\ 313 \\ 16 \frac{43}{120} \end{array}$$

$$\begin{array}{r} 10 \\ 8 \\ 3 \\ 21 \\ 120 \end{array} \quad \begin{array}{r} 120 \\ 120 \\ 120 \\ 120 \\ 120 \end{array} \quad \begin{array}{r} 1219-068 \\ 1517-165 \\ 1161-110 \\ 601-60 \\ 313 \end{array}$$

Case 4th

2 Add $\frac{1}{2}$ of a yard to $\frac{1}{4}$ of a foot

$$\begin{array}{r} \frac{1}{2} \\ \frac{1}{4} \\ 3 \frac{1}{2} \\ 213 \\ 112 \\ 2112 \\ 6 \end{array}$$

3 Add $\frac{1}{3}$ of a day to $\frac{1}{4}$ of an hour

$$\begin{array}{r} \frac{1}{3} \\ \frac{1}{4} \\ 3 \frac{1}{2} \\ 8 \end{array} \quad \begin{array}{r} 120 \\ 120 \\ 120 \\ 120 \end{array} \quad \begin{array}{r} 8-30 \\ 2160 \\ 30 \end{array}$$

4 Add $\frac{1}{3}$ of a week $\frac{1}{4}$ of a day and $\frac{1}{2}$ of an hour together

$$\begin{array}{r} \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{2} \end{array} \quad \begin{array}{r} 7 \\ 24 \\ 120 \end{array} \quad \begin{array}{r} 2-8-0 \\ 6-30 \\ 2-14-30 \end{array}$$

5 Add $\frac{1}{4}$ of a mile $\frac{2}{3}$ of a year and $\frac{1}{2}$ of a foot together

$$\begin{array}{r} \frac{1}{4} \\ \frac{2}{3} \\ \frac{1}{2} \end{array} \quad \begin{array}{r} 1760 \\ 1760 \\ 1760 \end{array} \quad \begin{array}{r} 1540-0-0 \\ 0-2-0 \\ 0-0-9 \end{array}$$

$$\begin{array}{r} 8112320 \\ 1540 \end{array}$$

Subtraction

Examples

1st Example
 Take $\frac{1}{2}$ from $\frac{1}{2}$
 $\frac{1}{2} - \frac{1}{2} = 0$

3rd Example
 Take $\frac{1}{2}$ from $\frac{3}{4}$
 $\frac{3}{4} - \frac{1}{2} = \frac{1}{4}$

11th Example
 Take $\frac{1}{2}$ from $\frac{11}{12}$
 $\frac{11}{12} - \frac{1}{2} = \frac{5}{12}$

5th Example
 Take $\frac{1}{4}$ from $\frac{5}{8}$
 $\frac{5}{8} - \frac{1}{4} = \frac{3}{8}$

6th Example
 Take $\frac{1}{2}$ from $\frac{11}{12}$
 $\frac{11}{12} - \frac{1}{2} = \frac{5}{12}$

$\frac{1}{2} - \frac{1}{2} = 0$

$\frac{1}{2} - \frac{1}{2} = 0$

$\frac{1}{2} - \frac{1}{2} = 0$

$\frac{1}{2} - \frac{1}{2} = 0$

$\frac{1}{2} - \frac{1}{2} = 0$

$\frac{1}{2} - \frac{1}{2} = 0$

Multiplication

From 11 weeks
Side 9" days
24
10 16 8
16 = 118
11 = 0
6 - 9 = 16 = 118
5 4 - 7 = 12

Multiply 48 3/4 by 10 1/2
48 3/4 10 1/2
243 18 6
5 6
243 + 88 = 331
5 = 6 - 30 = 180 (622)
216 3
216 9
6 3
3 3 3
3 3 3

Section 4

3 Multiply 3/4 by 1/2
3 1/4 1/2 = 3/8 cns
8 1 12 3
110 = 10 cns

Division of Vulgar
3 1/2 by 1/4
3 1/2 1/4
8 1/2 1/4
8 1/2 1/4

Divide 17/21 by 1/3
17 1/2 1/3 = 8 1/2
21 1/3 = 63 8 1/2 (128)
60 60
2 2
6 3

4 Multiply 2/3 of 2/3 by 1/2
2 2/3 1/2 = 2/3 cns
2 2/3 1/2 = 40 = 20

Divide 1 1/2 by 1/4
1 1/2 1/4 = 6
1 1/2 1/4 = 10
3 1 10
2 1 5
3 + 10 = 20 = 5 cns
2 + 48 = 96 = 16 cns

5 Multiply 7 1/2 by 1/4
7 1/2 1/4 = 1 7/8 cns
15 1/2 1/4 = 11 1/8
2 + 4 = 8 11 1/8 (1 7/8) cns
8 7
8

Divide 7/8 by 1/4
7/8 1/4 = 7/2 = 3 1/2 cns
7/8 1/4 = 11
8 7/8 = 64 = 32

6 Multiply 2/3 of 1 by 1/2
2/3 1/2 = 1/3 cns
3 1/2 = 2 1/2
4 1/2 = 4
27 1/2 = 18 1/2
4 1/2 = 3 1/2 (5 1/2) cns
29
32

Rule of Three In The

7 Divide $9\frac{1}{2}$ by $\frac{1}{2}$ of 7

$$\begin{array}{r} 9\frac{1}{2} \\ 6 \overline{) 51+2} \\ 6+7=42 \end{array} \quad \begin{array}{r} 1 \quad 7=7 \\ 2 \quad 1=2 \\ 100 \end{array}$$

$$\frac{6+7=42}{84} \quad \frac{2 \frac{13}{21} \text{ Ans}}{2 \overline{) 26=13}} \quad \frac{42=21}{21}$$

8th Divide $520\frac{1}{2}$ by $\frac{1}{2}$ of 91

$$\begin{array}{r} 520\frac{1}{2} \\ 26026+5=132130 \\ 5 \overline{) 132130} \\ 5+3641820 \end{array} \quad \begin{array}{r} 132130 \\ 12940 \\ 2580 \\ 1820 \\ 910 \overline{) 910=1} \\ 1820=2 \\ 182 \end{array}$$

Single Rule of Three or Vulgar fractions

If $\frac{3}{4}$ of a ton of iron cost $16\frac{1}{3}$ & what will $\frac{1}{4}$ of a ton come to

$$\begin{array}{r} 16\frac{1}{3} \\ 49 \overline{) 8874} \\ 3+2+7=42 \end{array} \quad \begin{array}{r} 8874 \\ 84 \\ 47 \\ 47 \\ 54 \\ 120 \\ 84 \\ 36 \\ 336 \\ 2 \overline{) 24=12} \\ 22=21 \end{array}$$

A person having $\frac{1}{2}$ of a coal mine sells $\frac{1}{4}$ of his share for 100 what is the value of the whole mine at the same rate

$$\begin{array}{r} 100 \\ 2 \overline{) 200=200} \end{array}$$

15 A man has 10 dollars per year what will he have come to 8 years

5 A gentleman having 100 acres of land sold $\frac{1}{4}$ of his land at 10 dollars per acre what will the whole be sold for

$$\begin{array}{r} 100 \\ 4 \overline{) 400=400} \end{array}$$

1 A man has 10 apples and sells $\frac{1}{4}$ of them for 1 dollar what will all be sold for at the same rate

$$\begin{array}{r} 10 \\ 4 \overline{) 40=40} \end{array}$$

Reverse Superstition

7. If a man be worth
1000 l. what part of it
may he give to his
children?

3000 l.

1000 l.

10. If a man be worth
1000 l. what part of it
should he give to his
children?

6000 l.

1000 l.

1000 l. 1000 l. 1000 l.

1000 l.

1000 l.

1000 l.

Rule.

1. How much shall I be
able to do with 1000 l. per
annum? or how much
shall I be able to do with

1000 l. per annum?

2. How many feet long
must a board be that is
3 feet wide, to equal
one that is 4 feet long
and 3 feet wide?

1000 l.

1000 l. 1000 l. 1000 l.

1000 l.

1000 l.

1000 l.

3. If a man hanging 2000 l.
or 1000 l. of goods were for
the same quantity of goods
write what quantity of the latter
make an equal trade.

1000 l.

1000 l. 1000 l. 1000 l.

1000 l.

1000 l.

1000 l.

4. If a hundred weight be
carried 200 miles for 100 l.
how far may a hundred weight be
carried for the same money?

1000 l.

1000 l. 1000 l. 1000 l.

1000 l.

1000 l.

1000 l.

1000 l.

5. If a man in 370 days having
all his laborer men with
the same work

1000 l.

Raising of Powers

Examples

1. What is the 3d power of 15?

15 x 15 x 15 = 3375

2. What is the 4th power of 15?

15 x 15 x 15 x 15 = 50625

3. What is the 5th power of 15?

15 x 15 x 15 x 15 x 15 = 759375

4. What is the 6th power of 15?

15 x 15 x 15 x 15 x 15 x 15 = 11390625

Square Root Examples

By Wm. Hall

1 What is the square root of 1441?

$$\begin{array}{r} 37 \\ 144 \overline{) 1441} \\ \underline{144} \\ 1 \end{array}$$

2 What is the square root of 1441?

$$\begin{array}{r} 37 \\ 144 \overline{) 1441} \\ \underline{144} \\ 1 \end{array}$$

3 What is the square root of 14782969?

$$\begin{array}{r} 3857 \\ 147 \overline{) 14782969} \\ \underline{147} \\ 82 \\ 82 \\ \underline{82} \\ 969 \\ 969 \\ \underline{969} \\ 0 \end{array}$$

4 What is the square root of 147006921?

$$\begin{array}{r} 12123 \\ 147 \overline{) 147006921} \\ \underline{147} \\ 0069 \\ 0069 \\ \underline{0069} \\ 21 \\ 21 \\ \underline{21} \\ 0 \end{array}$$

What is the square root of 387120489?

$$\begin{array}{r} 19683 \\ 38 \overline{) 387120489} \\ \underline{38} \\ 71 \\ 71 \\ \underline{71} \\ 20 \\ 20 \\ \underline{20} \\ 48 \\ 48 \\ \underline{48} \\ 9 \end{array}$$

5 What is the square root of 22071200?

$$\begin{array}{r} 4700 \\ 22 \overline{) 22071200} \\ \underline{22} \\ 71 \\ 71 \\ \underline{71} \\ 200 \\ 200 \\ \underline{200} \\ 0 \end{array}$$

6 What is the square root of 107200?

$$\begin{array}{r} 328 \\ 107 \overline{) 107200} \\ \underline{107} \\ 200 \\ 200 \\ \underline{200} \\ 0 \end{array}$$

7 What is the square root of 226800?

$$\begin{array}{r} 476 \\ 22 \overline{) 226800} \\ \underline{22} \\ 68 \\ 68 \\ \underline{68} \\ 00 \\ 00 \\ \underline{00} \\ 0 \end{array}$$

Square Root By Wm D. McCormick

10 What is the square root of 1112718051

10716
188 612
196 841
197 880

19710 3815556

11 What is the square root of 1112718050

10716
348 2921
356 3981
3562 225200
3562 2157256

12 What is the square root of 1112718051

10716
128 1175
138 23425
138 44 66193
138 189 9681109

13 What is the square root of 1112718051

10716
188 612
196 841
197 880

Rules

1 What is the square root of 25014

158 14
158 14
158 14

2 What is the square root of 25014

158 14
158 14
158 14

3 What is the square root of 15625

125
125
125

Square Root By The Rule

1st What is the square root of 3557

$$\begin{array}{r} 3557 \\ 496 \overline{) 355701756} \\ \underline{3332} \\ 2250 \end{array}$$

7.5 - 18662 - 40 Ans

$$\begin{array}{r} 166 \overline{) 1160} \\ \underline{996} \end{array}$$

$$\begin{array}{r} 1726 \overline{) 10400} \\ \underline{10356} \end{array}$$

$$\begin{array}{r} 173202 \overline{) 41140000} \\ \underline{346106} \end{array}$$

5 or

What is the square root of 478

$$\begin{array}{r} 478 \\ 549 \overline{) 478008706737120} \\ \underline{4392} \end{array}$$

$$\begin{array}{r} 3880 \\ 3843 \end{array}$$

$$\begin{array}{r} 3700 \\ 3270 \end{array}$$

$$\begin{array}{r} 4050 \\ 3843 \end{array}$$

$$\begin{array}{r} 2170 \\ 1647 \end{array}$$

$$\begin{array}{r} 527 \\ 4741 \end{array}$$

Ans

$$\begin{array}{r} 8706437525 \overline{) 93308} \\ \underline{81} \end{array}$$

$$\begin{array}{r} 183 \overline{) 656} \\ \underline{549} \end{array}$$

$$\begin{array}{r} 1863 \overline{) 5443} \\ \underline{3587} \end{array}$$

$$\begin{array}{r} 18608 \overline{) 1844525} \\ \underline{1411640} \end{array}$$

1st What is the square root of 3749

$$\begin{array}{r} 3749 \\ 47 \overline{) 3749} \\ \underline{339} \end{array}$$

$$\begin{array}{r} 151 \\ 1849 = 43 \end{array}$$

$$\begin{array}{r} 49 - 7 \overline{) 43} 6 \frac{1}{2} \text{ Ans} \\ \underline{42} \end{array}$$

2nd What is the square root of 2716

$$\begin{array}{r} 2716 \\ 16 \overline{) 2716} \\ \underline{171} \end{array}$$

$$\begin{array}{r} 27 \\ 441 - 21 \end{array}$$

$$\begin{array}{r} 16 - 6 \overline{) 21} 1 \frac{1}{2} \text{ Ans} \\ \underline{20} \end{array}$$

3rd What is the square root of 5725

$$\begin{array}{r} 5725 \\ 76 \overline{) 5725} \\ \underline{512} \end{array}$$

$$\begin{array}{r} 102 \\ 1296 = 36 \end{array}$$

$$\begin{array}{r} 25 - 7 \overline{) 36} 7 \frac{1}{2} \text{ Ans} \\ \underline{85} \end{array}$$

4th What is the square root of 949

$$\begin{array}{r} 949 \\ 47 \overline{) 949} \\ \underline{484} \end{array}$$

$$\begin{array}{r} 484 = 22 \text{ Ans} \\ 49 - 7 \overline{) 22} 3 \frac{1}{2} \end{array}$$

When this name you see,
Remember me,
And keep me in your
memory.

John C. Galloway
Nov 26th 1857

Square Root By ^{James} W. H. M.

5 What is the square root

$$\begin{array}{r} 47 \overline{) 21961} \\ \underline{94} \\ 125 \\ \underline{94} \\ 316 \\ \underline{281} \\ 35 \\ \underline{35} \\ 0 \end{array}$$

6 What is the square root of $8\frac{2}{5}$ $7\frac{1}{5}$

$\frac{2}{5}$

$7 \overline{) 87142857129579}$

$49 \overline{) 491}$

$585 \overline{) 3542}$

$5901 \overline{) 31585}$

$59629 \overline{) 5882171}$

5881

5882171

581261

(Ans)

9 What is the square root of

$$\begin{array}{r}
 15111 \\
 \hline
 8573333 \quad (127) \text{ Ann} \\
 81 \\
 182 \quad \overline{) 273} \\
 \underline{362} \\
 1847 \quad \overline{) 12783} \\
 \underline{12783}
 \end{array}$$

The top of a castle from the ground is 100 feet high and is surrounded with a ditch 60 yds. broad which length must a cable be to reach from the outside of the ditch to the top of the castle.

$$\begin{array}{r}
 60 \\
 60 \\
 3600 \\
 \hline
 225 \\
 180 \\
 2025 \\
 3600 \\
 \hline
 5625
 \end{array}$$

3 In a right angle triangle
A B C the hyp. the base line
AC is equal the base A B
is equal the length of
the perpendicular line B C.

$$\begin{array}{r} 27 \\ 158 \\ \hline 326 \\ 129 \\ \hline 455 \end{array}$$

1 ~~What~~ the wall of a fort
is 30 ft high and the ditch
before it is 24 feet wide it is
required to find the length of
a ladder that will reach to
the opposite side of the ditch

$$\begin{array}{r} 27 \\ 27 \\ \hline 189 \\ 511 \\ \hline 729 \end{array}$$

$$\begin{array}{r} 36 \\ 36 \\ \hline 216 \\ 108 \\ \hline 1296 \\ 1728 \\ \hline 2025 \end{array}$$

$$813 \overline{) 2125} \\ \underline{1425} \\ 700$$

In the right angled triangle
as ed B C the line ed is 40 feet
B C is feet required the length
of the line ed B

$$\begin{array}{r} 75 \\ 75 \\ \hline 375 \end{array}$$

$$\begin{array}{r} 41 \\ 41 \\ \hline 202 \end{array}$$

$$\begin{array}{r} 52 \\ 562 \\ 202 \\ \hline 364 \end{array}$$

$$364 \div 600 = 0.606666$$

— 111 —

1 If the content of a given circle be 100 What is the side of a square equals

1264701

22 / 60

246 11602
11616

246111 2 1470

2497 12544-2
222881

240 981 13 211370

9111 9812119 5-2581-0

24 6 73 12 1

2-1-77

2) If the area of a circle be 2655
what is the side of the square equal

2023 (4) 19. c

8) } 412.3
47.3

3 If the area of a circle be
what is the side of the square equal.

2738'612 (Ans)

14 1/2 1 3 1 6
2 3 7

5243 / 2140
1627

5-1168) 49782

14364 / 335600

$$\begin{array}{r} 328576 \\ \times 794462 \\ \hline \end{array}$$

549721
520954

1 There is a circle whose diameter is 4 ft. what is the diameter of one 4 times as large

$$\begin{array}{r} 4 \\ 16 \\ \hline 64 \end{array} \quad \begin{array}{r} 4 \\ 16 \\ \hline 64 \end{array}$$

2. It has a circular yard
100 feet diam but was to
enlarge to one of 300 area which
will the diameter of the circle
one measure 100

27 189

11

7

262

3. If the diameter of a circle is 1 inch, what will be the diameter of a circle twice half the size.

112

146

22

(4)

10

1774

77

Square Root By W. H. M.

1 When the area is 160 what is the diameter

$$\begin{array}{r}
 160 \quad (126491 \\
 22 \overline{) 160} \\
 246 \overline{) 1600} \\
 2524 \overline{) 16000} \\
 25289 \overline{) 160000} \\
 252981 \overline{) 1600000}
 \end{array}$$

$$\begin{array}{r}
 126491 \\
 112837 \\
 885437 \\
 399473 \\
 1011928 \\
 252981 \\
 126491 \\
 126491 \\
 14272864767 \text{ Ans}
 \end{array}$$

2 What length of halter will be sufficient to fasten a horse that from a post in the centre so that he may be able to graze upon an acre of grass and no more.

$$\begin{array}{r}
 160 \quad (1264910 \\
 22 \overline{) 160} \\
 246 \overline{) 1600} \\
 2524 \overline{) 16000} \\
 25289 \overline{) 160000} \\
 252981 \overline{) 1600000} \\
 126491 \\
 112837 \\
 885437 \\
 399473 \\
 1011928 \\
 126491 \\
 126491 \\
 142728 \\
 71964 \\
 162 \\
 174606 \\
 12 \\
 52
 \end{array}$$

Application

1 If an army of 20736 men is formed into a square column how many men will front

$$20736 \quad (14400 \text{ Ans}$$

$$\begin{array}{r}
 22 \overline{) 107} \\
 96 \\
 284 \overline{) 1136}
 \end{array}$$

2 How many feet of board will it require to lay the floor of a room that is 25 feet square

$$\begin{array}{r}
 25 \\
 25 \\
 \hline
 125 \\
 50 \\
 \hline
 625 \text{ Ans}
 \end{array}$$

3 A certain square pavement contains 17424 square stones of the same size how many are contained in one side

$$17424 \quad (132 \text{ Ans}$$

Cult Root By W. H. M.

Enchiridion

1. 1/2 lb. of ...
... 9.11.18

$$\begin{array}{r} 2 \times 2 = 4 \\ 2 \times 4 = 8 \\ \hline 1456 \end{array}$$

3rd Lat is the whole root of 23.

7. 713 1474 2722081 7-4611
 1512 6248

1/4 x 1/2 inch square

7/17/86

$$\begin{array}{r}
 399473 \\
 1011928 \\
 126491 \\
 12649 \\
 \hline
 21142428 \\
 71964 \\
 162 \\
 \hline
 184606 \\
 10 \\
 \hline
 52
 \end{array}$$

5 What is the tube out of zinc

11577 841 6 11577 11579 (1/2)

What is the subject of

[illegible]

What is the square root of

[illegible]

W. L. R.

Cube Root

777

8 What is the Cube Root of 22067810125
 $2 + 2 + 5 = 1264$ $22067810125 / 2805$ Ans
 $2 + 8 = 30$ 1180
 14 5 4 11067
 15752

$280 + 280 + 5 = 2852025$ 11781125
 $280 + 5 + 25 = 2852025$ 11781125

9 What is the Cube Root of 219365327791
 $6016015 = 1088101$ $219365327791 / 6031$ Ans
 $6013430 = 1188101$ 216
 1088101 3365327
 3256227
 $603160343 = 107082701$ 18110160711 150791
 $60341180 = 107082701$

10 What is the Cube Root of 673373027026
 $87873 = 19248$ $673373027026 / 6031$ Ans
 $87900 = 1680$ 512
 20927 61373
 1146503
 $87873 + 3 = 1670736$ 1686396 11087097
 $8716 - 30 = 15640$ 10118073
 180837600
 $876187645 = 23022825$ 23022825 2181721125
 $87675 = 30$ 18110160711 2181721125
 23022825

11 What is the Cube Root of 1471151121
 $24243 = 1217$ 138714177
 $24313 = 180$ 4111
 1331
 $24243 + 3 = 5125$ 102115 810811
 $234513 = 3481$ 810811

12 What is the Cube Root of 1852125
 $21243 = 1225$ 1852125 Ans
 $2125 = 1225$ 1852125
 $2125 + 3 = 1875$ 1852125
 1852125
 $2125 + 2125 + 3 = 852125$ 1852125
 $2125 + 6 = 1852125$

Cube Root

What is the cube root of 25768 Ans 30

30

What is the cube root of 32768 Ans 32

$$12 \times 12 \times 3 = 432$$

$$24 \times 24 \times 17 = 9624$$

What is the cube root of 1728 Ans 12

What is the cube root of 1728 Ans 12

Rule.

What is the cube root of $\frac{324}{1500}$ Ans $\frac{2}{5}$

$$12 \sqrt[3]{\frac{324}{1500}} = \frac{27}{125} = \frac{3}{5}$$

What is the cube root of $\frac{1}{8}$ Ans $\frac{1}{2}$

$$1 \sqrt[3]{\frac{1}{8}} = \frac{1}{2}$$

Cube Root By W. H. 166

Ques

What is the cube root of $44^{\frac{1}{3}}$

$$\begin{array}{r} 8+8+3=19 \quad 204 \\ 8+204=212 \quad 87 \\ 8+212=220 \quad 57 \\ 8+220=228 \quad 87 \\ 8+228=236 \quad 57 \\ 8+236=244 \quad 87 \end{array}$$

Ans

What is the cube root of $31^{\frac{1}{3}}$

$$\begin{array}{r} 8+8+3=19 \quad 204 \\ 8+204=212 \quad 87 \\ 8+212=220 \quad 57 \\ 8+220=228 \quad 87 \\ 8+228=236 \quad 57 \\ 8+236=244 \quad 87 \end{array}$$

Ans

What is the cube root of $8^{\frac{1}{3}}$

$$\begin{array}{r} 8+8+3=19 \quad 204 \\ 8+204=212 \quad 87 \\ 8+212=220 \quad 57 \\ 8+220=228 \quad 87 \\ 8+228=236 \quad 57 \\ 8+236=244 \quad 87 \end{array}$$

Rule

What is the cube root of $11^{\frac{1}{3}}$

$$\begin{array}{r} 11 \\ 11 \\ 11 \\ 11 \\ 11 \\ 11 \end{array}$$

What is the cube root of $12^{\frac{1}{3}}$

$$\begin{array}{r} 12 \\ 12 \\ 12 \\ 12 \\ 12 \\ 12 \end{array}$$

What is the cube root of $110^{\frac{1}{3}}$

W. H. M

$$\begin{array}{r} 110 \\ 110 \\ 110 \\ 110 \\ 110 \\ 110 \end{array}$$

[illegible]

195

1000
00021

871112857111 (205412)

12.51

100

1200-

Chlorophyllum - 1891

17

816666666 (2092)

12148 1 1 95529

3156 44 553 7666

1. If the total content of a globe is 100,000
that is the case of a globe when uninflated

1. *Pinus strobus* L. 10/10/10

L. The school opened on the 1st of 33. 1841
 L. The school opened on the 1st of 33. 1841

EXAMPLES

that is much 28242420
24242420

1261 / 1160
1261
1261 / 1160

132564 / 267128

19178656

$$212 + 4 - 77 = 139$$

Cube Root

4. What is the cube root of 1728 feet and what part of it? Answer: 12 feet.

$$\begin{array}{r} 12 \\ 12 \\ \hline 144 \\ 12 \\ \hline 216 \end{array}$$

$$\begin{array}{r} 6 \\ 6 \\ \hline 36 \\ 6 \\ \hline 216 \end{array}$$

$$216 \overline{) 1728} \quad \text{Ans}$$

5. A cubical foot how many cubes of 6 inches and how many of 12 inches contained therein?

$$\begin{array}{r} 16 \\ 16 \\ \hline 256 \end{array} \quad \begin{array}{r} 8 \\ 8 \\ \hline 64 \end{array} \quad \begin{array}{r} 128 \\ 128 \\ \hline 16384 \end{array}$$

1807/20

A merchant bought 50 yards of linen at 20 cts for the first yard 15 for the second 6 for the third & increasing 2 cts every yard what was the price of the last yard how much the whole amount and what the average price per yard cts

Operation $\frac{56}{56}$ number of terms

The Answer $\frac{49}{2}$ number of men before

Child 98 first term

Multip by sum number of letters

50/23 50

5. To buy the salt grass
seed, the whole amount
\$1.00 to the average price per lb.

the whole amount

87 to the average price per of

2 Bought 20 yds of calico at 8 cts for the first yard
6 for the second & for the third 9. What did the whole
cost

20 29 68

20
 18
 14
 6 6
 6 5
 20
 2 12260
 1.5 07 1/2

If 100 apples were laid two yards distant from each other in a right line and a basket of five two yards distant from the first apple the distance must a person travel to gather them singly into the basket

11 Crows miss from 100 yds.

(Faint handwritten notes and calculations are visible in the background.)

47

(1) The whole and $\frac{1}{2}$ for anagram

96
26
Amount for the first year

$$\begin{array}{r} 20 \\ 2 \overline{) 1130} \\ \underline{104} \\ 90 \\ \underline{80} \\ 10 \\ \underline{10} \\ 0 \end{array}$$

— 55 —

by the last stone
over the whole.

$$\begin{array}{r} 1009 \\ \times 949 \\ \hline 9081 \\ 10090 \\ 100900 \\ \hline 966081 \end{array}$$

last week

which cost

3 Progression By W H M Rule 1 It is to receive from B a certain sum

to be paid in several payments in Arithmetic progression the first payment to be 20 £ and the last to be 100 £ What is the common difference, what was each payment and how much the whole debt.

Operation

100 last term

20 first term

No of terms 11 10 / 80 the difference

8 common difference

20 100 10 2 660 whole debt

20 first payment

20 + 8 = 28 second do

28 + 8 = 36 third do &c

3 A man is to travel from pilsburgh to a certain place in 12 days and is to travel the first day increasing each day by 10 miles the last day increasing each day by 10 miles the whole distance is 1000 miles what is the distance each day

promising to pay 100 £ the first of every month for a year what is the sum of money

2. A machine sold in words of action. The copy of the
for the ~~and~~ first of the year. The first of the year
and the first of the year. The first of the year.

73 567

2120-90

1000000

19

16747-214

201806777215

944

— 24 —

03114

170

124

三

5

40.

9/5



This image shows a blank, aged, cream-colored page, likely an endpaper or flyleaf of a book. The paper has a slightly textured appearance with some minor discoloration and a dark, irregular stain along the left edge, possibly from a binding or binding material. There is no text or other markings on the page.

This image shows a blank page from a document. There are dark vertical bars along the left and right edges, likely representing the binding or scanning artifacts. The central area is a uniform light beige color.



10

10

10

1

2

1

1

General and Inquisition

17th June 1791

18th June 1791

19th June 1791

20th June 1791

21st June 1791

22nd June 1791

23rd June 1791

24th June 1791

25th June 1791

26th June 1791

27th June 1791

28th June 1791

29th June 1791

30th June 1791

1st July 1791

2nd July 1791

3rd July 1791

4th July 1791

5th July 1791

6th July 1791

7th July 1791

8th July 1791

9th July 1791

10th July 1791

11th July 1791

12th July 1791

511

Geometrical Proposition

Let ABCD be a parallelogram, and let E be a point in the line AC. Draw BE and CE. Then the triangles ABE and CED are equal in area.

1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19 20

21 22 23 24 25 26 27 28 29 30

1

2
2

Position By Mrs H. M. M.

Rule 3 A and C buy a carriage for 340 8 of which
 A pays three times as much as B and B four times as
 much as C what did each pay (Ans) A paid 240 8
 B paid 80 8
 C 20

$$\begin{array}{r} 3 \overline{) 144} \\ 4 \overline{) 204} \end{array}$$

$$\begin{array}{r} 340 \\ 5760 \\ 4020 \\ \hline 204 \overline{) 48960} \end{array}$$

$$\begin{array}{r} 3 \overline{) 240} \\ 4 \overline{) 80} \end{array}$$

4 What is the sum of which is 5 and 2 make 118 8
 Ans 240 8 240

$$\begin{array}{r} 4 \overline{) 100} \\ 11 \overline{) 118} \end{array}$$

$$118 \div 11 = 10 \text{ R } 8$$

$$118 \div 11 = 10 \text{ R } 8$$

5 A person having spent 1/3 of his money
 had 16 8 left what had he at first (Ans) 160 8

$$\begin{array}{r} 2 \overline{) 18} \\ 3 \overline{) 12} \end{array}$$

$$12 \div 2 = 6$$

$$8 \div 2 = 4$$

6 A B and C talking of their ages B said
 his age was once and a half the age of B C said
 his age was twice and one the the age of both and that sum
 of their ages was 93 what was the age of each (Ans) 12 18 75

$$\begin{array}{r} 1 \overline{) 20} \\ 2 \overline{) 36} \\ 3 \overline{) 105} \end{array}$$

$$155 \overline{) 1860}$$

$$155 \overline{) 1860}$$

$$\begin{array}{r} 1 \overline{) 12} \\ 2 \overline{) 18} \end{array}$$

$$12 \div 2 = 6$$

$$18 \div 2 = 9$$

$$12 \div 2 = 6$$

2

902

96

9



10



1

100

Rule 2 A and B have the same income A saves the $\frac{2}{3}$ of his but B by spending $60\$$ per annum more than A at the end of 8 years finds himself $40\$$ in debt. What is their income and how much does each spend per annum?

3. saves the 2 of his but B by spending 60¢ for an und more than
A at the end of 8 years finds himself 40¢ indt. What is
their income and how much does each spend for an und

each spend per annum

| | | |
|---|------|----|
| 1 | 2000 | de |
| 2 | 175 | de |
| 3 | 200 | de |

126
116
82

110
120
14268
3808

40
50
20

8.0 / 16000
Los Angeles

2 1/2 ft. long 16 0
 8 1/2 ft. 12 8
 11 0

1270
1285 *Syrphids*
140
200
200 *B. sp.*

3 A B and C would divide 100 \$
between them so as to have 3
\$ more than A and C 8 more than B
how many \$ must each have

20
 23
 28
 48
 98

Sub
 2'c
 23
 24
 27
 1.00
 1.70
 3.00

2'c
 23
 24
 27
 1.00
 1.70
 3.00

$$\begin{array}{r} 30 \\ 36 \\ \hline 66 \end{array}$$

~~$$\begin{array}{r}
 40 \\
 30 \\
 \hline
 6.6 \overline{) 1200} \\
 \underline{26} \text{ cs} \\
 23 \text{ B} \\
 \underline{1} \\
 24 \text{ cs}
 \end{array}$$~~

Mr H. C. C. C. C.

Double Penmanship

18 Aug

[illegible]

$$\begin{array}{r} 21 \\ \hline 5000 \\ 3000 \\ 2000 \\ \hline 10000 \end{array}$$

Suppose.

2nd

$$\begin{array}{r} 10 \\ 3 \\ \hline 30 \end{array}$$

$$\begin{array}{r} 10 \\ 50 \\ \hline 2166 \\ 502 \text{ and } 1 \\ \hline 50 \\ 50 \\ \hline 80 \\ 20 \\ \hline 56 \end{array}$$

2.

22. 100 1/2 horse.

| | |
|----------|-----|
| Step 140 | 140 |
| 2190 | 120 |
| 140 | 95 |
| 95 | 25 |

25 27th Nov 1860

22

Double Position By 7th

6 The head of a fish is 7 inches long and its tail is as long as its head and half its body and its body is as long as its head and tail together. What is its whole length? At 6 feet

Sup
 $1 \frac{1}{2}$
 $1 \frac{1}{2}$
 95
 9
 165
 9
 255
 11
 $105 + 12$

2060
 1230
 11
 1
 211
 2

30
 30
 6

152
 2
 92

Sup 30 1021

Sup 60 31

100

6000

2

630

$10 + 2$

1005142

$95 \frac{1}{5} 25 \frac{1}{5} 42$
 125
 6 feet

Permutation By H. M.

Q. What number of variations will the 9 digits admit of

32658129

02
30

900

0912345678

9
6

2
2

Subtraction of Duodecimals

Example

$$\begin{array}{r} \text{ft. in. p. m. m.} \\ 1839 \text{ } 7 \text{ } 5 \text{ } 0 \\ 916 \text{ } 8 \text{ } 1 \text{ } 8 \end{array}$$

3 pence a hand saw is
 1839 7 5 0
 916 8 1 8
 923 1 6 3 2

$$\begin{array}{r} 359 \text{ } 2 \text{ } 0 \\ 76 \text{ } 11 \text{ } 8 \end{array}$$

A person having lined several
 measures of canvas by wither by
 material in the amount of 100
 measures of canvas
 was put in chains & counted
 several deductions being to be made
 for various arches & the
 amount of 6000
 was to be made for how many
 of workmanship was to be made
 in length & breadth 8 ft 6 in by 10 ft 6 in

$$\begin{array}{r} \text{ft. in. p. m. m.} \\ 1839 \text{ } 7 \text{ } 5 \text{ } 0 \\ 916 \text{ } 8 \text{ } 1 \text{ } 8 \end{array}$$

how about the price of canvas
 lines as they can sell them
 at dinner this offer being

$$\begin{array}{r} 162 \\ 210 \\ 840 \\ 2520 \\ 365 \end{array}$$

Multiplication of Duodecimals

RULE

1. Multiply the whole number by the whole number

$$\begin{array}{r} 6 \text{ } 2 \text{ } 1 \\ 8 \text{ } 2 \text{ } 1 \\ 2 \text{ } 3 \end{array}$$

3. Multiply the whole number by the whole number

$$\begin{array}{r} 6 \text{ } 2 \text{ } 1 \\ 8 \text{ } 2 \text{ } 1 \\ 2 \text{ } 3 \end{array}$$

4. Multiply the whole number by the whole number

$$\begin{array}{r} 6 \text{ } 2 \text{ } 1 \\ 8 \text{ } 2 \text{ } 1 \\ 2 \text{ } 3 \end{array}$$

5. Multiply the whole number by the whole number

$$\begin{array}{r} 6 \text{ } 2 \text{ } 1 \\ 8 \text{ } 2 \text{ } 1 \\ 2 \text{ } 3 \end{array}$$

$$\begin{array}{r} 6 \text{ } 2 \text{ } 1 \\ 8 \text{ } 2 \text{ } 1 \\ 2 \text{ } 3 \end{array}$$

$$\begin{array}{r} 6 \text{ } 2 \text{ } 1 \\ 8 \text{ } 2 \text{ } 1 \\ 2 \text{ } 3 \end{array}$$

Y. H. C. H.

Multiplication of Duodecimals

There is a house with three tiers of windows. The height of the first tier is 4 ft. 6 in. of the second 4 ft. 3 in. and the breadth of each window is 4 ft. 6 in. What will the glazing come to at 100 lb. per sq. ft.

4 ft. 6 in. = 4.5
4 ft. 3 in. = 4.25
4 ft. 6 in. = 4.5
Breadth of each window = 4.5
Area of first tier = 4.5 x 4.5 = 20.25
Area of second tier = 4.25 x 4.5 = 19.125
Area of third tier = 4.5 x 4.5 = 20.25
Total area = 20.25 + 19.125 + 20.25 = 59.625
Cost at 100 lb. per sq. ft. = 59.625 x 100 = 5962.5

There is a house with three tiers of windows. The height of the first tier is 4 ft. 6 in. of the second 4 ft. 3 in. and the breadth of each window is 4 ft. 6 in. What will the glazing come to at 100 lb. per sq. ft.

RULE

1. Multiply the height of the first tier by the breadth of the window to find the area of the first tier.
2. Multiply the height of the second tier by the breadth of the window to find the area of the second tier.
3. Multiply the height of the third tier by the breadth of the window to find the area of the third tier.
4. Add the areas of the three tiers to find the total area.
5. Multiply the total area by the price per square foot to find the total cost.

302
36
900
973
9
6
2
2

Capitulos or History Rule

1. *Requisita* ...
 2. *Requisita* ...
 3. *Requisita* ...

4. *Requisita* ...
 5. *Requisita* ...
 6. *Requisita* ...

7. *Requisita* ...
 8. *Requisita* ...
 9. *Requisita* ...

10. *Requisita* ...
 11. *Requisita* ...
 12. *Requisita* ...

13. *Requisita* ...
 14. *Requisita* ...
 15. *Requisita* ...

16. *Requisita* ...
 17. *Requisita* ...
 18. *Requisita* ...

19. *Requisita* ...
 20. *Requisita* ...
 21. *Requisita* ...

30²
36

0900

0900

09
56

2
= 2

1000

Measuring of Boards

Rule

1. The quantity of a piece of squared timber 12 inches wide and 8 inches deep required the solidity, 8 ft 6 in.

12 ft 6 in. 12 ft 6 in.

Rule

2. If a piece of squared timber 12 inches square at the greater end and 8 inches square at the lesser end and 8 feet long the solidity 8 ft 6 in.

12 ft 6 in. 12 ft 6 in.

3. If a piece of squared timber 12 inches square at the greater end and 8 inches square at the lesser end and 8 feet long the solidity 8 ft 6 in.

12 ft 6 in. 12 ft 6 in.

4. If a piece of squared timber 12 inches square at the greater end and 8 inches square at the lesser end and 8 feet long the solidity 8 ft 6 in.

12 ft 6 in. 12 ft 6 in.

30²
30
0900

0900

0900

2
2

Carpenter's And Joiner's Work

5 Require the amount of the pieces of round timber measuring as follows

10 ft long and measuring 6 in
the diameter
the piece 11 ft long
the piece 12 ft long
the piece 13 ft long
the piece 14 ft long
the piece 15 ft long
the piece 16 ft long
the piece 17 ft long
the piece 18 ft long
the piece 19 ft long
the piece 20 ft long

Ans 258 70

Carpenter's And Joiner's Work

1 A piece of timber 10 ft long and 9 inches broad how many squares does it contain

Ans 10 squares

2 A piece of timber 10 ft long and 12 ft 3 inches high how many squares are contained in it and how much does it contain

Ans 12 1/2 squares

4 A room is 35 ft long and 20 ft wide there is in it a fire place which measures 6 ft by 4 ft 6 in and a well hole for the stairs measuring 10 ft 6 inches by 6 ft

What will the flooring come to at 58 and 75 cts per square

Ans 58 214 cts

5 How many squares are contained in a partition that is 82 ft 6 inches long and 12 ft 3 inches high

Ans 10 squares

6 If a partition between rooms be in length 11 ft 6 inches and its length high 10 ft 3 inches how many squares are contained in it and how much does it contain

Ans 12 1/2 squares

Sample

...and the comfort of the
...many
...of

That will the undersigned
of a room come to it itself for
all square and opposite the height of the
bottom including the cornice and
remoulding height of the arches and the height of
the shaft to the window sills and
the height of the door to the top of the
arch sills and door frame and the

[Faint handwritten notes and calculations, possibly related to the preceding page's work.]

09
56

2
2

Brick Layers Work

EXAMPLES

1

Suppose you are to build a wall above the wall of a house
 12 ft. high - and the width is 15 ft. and
 the thickness is 1 ft. and height is 12 ft.
 to calculate the work.

Ans. 1440

4 A triangle gable roof is
 raised to the height of 12 ft
 above the wall of a house
 whose width is 15 ft. and
 the thickness of the wall is
 1 ft. calculate the work.
 Ans. 1440
 Measure Area 1440 ft.

22
 216
 33
 216
 214 56 252 Rods
 44
 180

Work

180

50

180

180

Masons Work By W. H. M.

RULE

2 How many solid feet and perches 10 inches at 8000 per superficial are contained in a wall 60 ft long 4 ft thick and 12 ft high and 2 ft thick.

What is a marble slab worth where length 4 ft and breadth 1 ft.

1295
6125
8675
6125
6334 2
1295
2875
7525
4950
28950
22275
14475
12675
165
10
8235
165
2495

5 4 11
2 6 5 7 10
16 10 2 10
80
8
16
8 16 11.5

3 If a wall be 10 ft long and 10 ft high how many superficial are contained therein.

10175
20350
53875
218500
1728 122885 1100
482

be 112 ft long and 6 ft high how many superficial rods each ft square are contained therein.

11225
165
56175
64350
11225
68178 2425 (24) Rods
572
567
157

902
36
0900

0903

09
56

2
2

90^a
50

0902

096

89
5-6

[Faint handwritten notes and numbers, possibly bleed-through from the reverse side.]

9012

F²
= 2

Painters Work Book

RULE

2. To find the measure of a room, multiply the length by the breadth, and the product will be the measure of the room. Thus, if the length be 12 ft. and the breadth 8 ft. the measure of the room is 96 sq. ft. If the room be 12 ft. long and 8 ft. wide, and there be a chimney 4 ft. wide, the measure of the room is 88 sq. ft. If the room be 12 ft. long and 8 ft. wide, and there be a chimney 4 ft. wide, the measure of the room is 88 sq. ft.

3. To find the measure of a room, multiply the length by the breadth, and the product will be the measure of the room. Thus, if the length be 12 ft. and the breadth 8 ft. the measure of the room is 96 sq. ft. If the room be 12 ft. long and 8 ft. wide, and there be a chimney 4 ft. wide, the measure of the room is 88 sq. ft. If the room be 12 ft. long and 8 ft. wide, and there be a chimney 4 ft. wide, the measure of the room is 88 sq. ft.

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7. To find the measure of a room, multiply the length by the breadth, and the product will be the measure of the room. Thus, if the length be 12 ft. and the breadth 8 ft. the measure of the room is 96 sq. ft. If the room be 12 ft. long and 8 ft. wide, and there be a chimney 4 ft. wide, the measure of the room is 88 sq. ft. If the room be 12 ft. long and 8 ft. wide, and there be a chimney 4 ft. wide, the measure of the room is 88 sq. ft.

8. To find the measure of a room, multiply the length by the breadth, and the product will be the measure of the room. Thus, if the length be 12 ft. and the breadth 8 ft. the measure of the room is 96 sq. ft. If the room be 12 ft. long and 8 ft. wide, and there be a chimney 4 ft. wide, the measure of the room is 88 sq. ft. If the room be 12 ft. long and 8 ft. wide, and there be a chimney 4 ft. wide, the measure of the room is 88 sq. ft.

What cost the painting of a room at 1/2 p. per sq. ft. its length 12 ft. its breadth 8 ft. 3 in. and its height 12 ft. 3 in. also the door is 4 ft. by 6 ft. and the window 8 ft. by 4 ft. of two windows each 4 ft. by 3 ft. but the breaks of the windows themselves are 8 ft. high and 1 foot 3 inches deep.

12 ft. 3 in. to deduct for the door deducting a bare place of 4 ft. by 6 ft. also 4 dolls. 10 cts.

24 6
16 3
40 9
81 6
12 9
94 5
61 1 6
103 7 1 6
24 6 6
27 1 6
21 3 0
211 12 0 0
28 5
4 6
4 38
1 2
741 cts.

12 ft. 3 in. to deduct for the door deducting a bare place of 4 ft. by 6 ft. also 4 dolls. 10 cts.

Slayers

Work

If a window be 4 ft by an 8 ft
 broad how many square feet of glazing
 are contained therein etc. 32

$$\begin{array}{r} 4 \times 8 = 32 \\ 21 \times 9 = 189 \\ 3 \times 4 = 12 \\ 24 \times 7 = 168 \end{array}$$

3 There is a house with three tiers
 of windows in a figure the height of
 the first tier is 6 ft of the second
 8 ft and of the third 10 ft the breadth
 of each window is 5 ft what will the
 glazing come to at all levels per foot

| | |
|---------|---------|
| 6-11-6 | 5-4-6 |
| 20-9 | 14-0 |
| 8-8-6 | 2-80 |
| 24-2-6 | 18-8-6 |
| 16-9-6 | 180-8-0 |
| 130-8-0 | 14-10-6 |
| 104-1-6 | 104-1-6 |
| 140-8-0 | |

What will the glazing
 for triangular sky light

$$\begin{array}{r} 16 \times 6 = 96 \\ 104 \times 8 = 832 \\ 20 \times 2 = 40 \\ 58 \times 8 = 464 \\ 586 \text{ etc.} \end{array}$$

$$\begin{array}{r} 1009 \\ 201 \\ 8 \\ 3 \\ 57 \\ 323 \\ 331 \end{array}$$

$$1.88 \times 10^5 = 188000$$

What is the area of a triangle
 with a base of 10 ft and a height of 6 ft

$$\begin{array}{r} 10 \times 6 = 60 \\ 20 \times 8 = 160 \\ 30 \times 10 = 300 \end{array}$$

6 There is a house with three tiers
 of windows in a figure the height of
 the first tier is 6 ft of the second
 8 ft and of the third 10 ft the breadth
 of each window is 5 ft what will the
 glazing come to at all levels per foot

| | |
|---------|---------|
| 6-11-6 | 5-4-6 |
| 20-9 | 14-0 |
| 8-8-6 | 2-80 |
| 24-2-6 | 18-8-6 |
| 16-9-6 | 180-8-0 |
| 130-8-0 | 14-10-6 |
| 104-1-6 | 104-1-6 |
| 140-8-0 | |

$$\begin{array}{r} 692 \\ 14 \\ 177 \\ 699 \\ 17875 \end{array}$$

302
 36

0900

0913

09
 5-6

2
 2

Measurement of ground

Rule

I For a square plot each side
measured 40 ft. the base or longest side is 40 ft. and the perpendicular is 40 ft.

$$40 \times 40 = 1600$$

I A piece of square ground measures
100 ft. on each side what is the
content in acres?

$$\begin{array}{r} 100 \\ \times 100 \\ \hline 10000 \end{array}$$

Rule

I For a piece of ground lying
in the form of an oblong square
the length measures 240 ft. and
the breadth 40 ft. what is the
content in acres?

$$\begin{array}{r} 240 \\ \times 40 \\ \hline 9600 \end{array}$$

I For a ground lying in
the form of an oblong square
measures 240 ft. in length and
40 ft. in breadth what is the
content in acres?

$$\begin{array}{r} 240 \\ \times 40 \\ \hline 9600 \end{array}$$

Rule

I A triangular piece of ground
the base or longest side is 40 ft. and the perpendicular is 30 ft.
how many acres does it contain?

$$\begin{array}{r} 40 \times 30 = 1200 \\ \div 2 = 600 \end{array}$$

$$\begin{array}{r} 1200 \\ \div 100 = 12 \end{array}$$

How many superficial
yards contained in a triangular
piece of ground the base of which
measures 100 ft. and perpendicular
40 ft. Ans. 100 yds.

$$\begin{array}{r} 100 \times 40 = 4000 \\ \div 2 = 2000 \end{array}$$

Rule

I A piece of ground lying
in the form of an oblique parallelogram
measures 100 ft. along its base
and its perpendicular height is 40 ft.
how many acres does it contain?

$$\begin{array}{r} 100 \times 40 = 4000 \\ \div 2 = 2000 \end{array}$$

Measurement of ground

Rule

In a field of several acres
 To diagonal line between the most
 distant measures in rods and the
 perpendicular measure the one way
 and the other suffices require the use
 of a cross it contains *Ans 24*

140
 72
 1100
 800
 2086 100
 100 feet 20
 10 1108
 10 29 *Ans*

Rule 2 If a gentleman has an elliptical
 yard in front of his house the longest
 diameter of which measures 100 feet
 and the shortest is how much ground
 contained there in *Ans 24*

Of Laying

Rule

The diameter of a lot at the
 long measure 20 at the 10 inches and
 its length is 20 inches what is its
 content in square measure *Ans 100*

6 2 7 8
 2 2
 2 2
 4 10
 4 4
 4 8 4
 2 4

1920
 168

116 16 13 9 10 *Ans*

8 8 2
 2 4 9 6
 2 4 4 6
 2 1 3 5 4 9

Measurement

11 1 3 1 2
 2 3 3 1 2 *Ans*

3 How many square yds
 are contained in a circular
 piece of ground the
 diameter of which is 100
 feet *Ans 24*

160
 160
 160
 160
 2 6 0 0
 9 2 0 1 2 5 2 10
 2 2 5 4 7 *Ans*

11 1 1
 11

302
 36

0900

0900

09
 56

2
 2

Miscellaneous Questions

1. What is the sum of a square and its side when the side is 1000?

A general drawing up his army into a solid square found he had 1000 men on each side but increasing each side with one soldier he wanted 44 couple the square

2. What is the difference between two numbers when the sum is 1000 and the difference is 100?

how many men did his army consist of?

$$\begin{array}{r} 1000 \\ - 100 \\ \hline 900 \end{array}$$

$$\begin{array}{r} 1000 \\ - 44 \\ \hline 956 \end{array}$$

3. There is the sum of three bags the first contains 1000 the second 500 how many are there in the third bag?

$$\begin{array}{r} 1000 \\ + 500 \\ \hline 1500 \end{array}$$

$$\begin{array}{r} 1000 \\ + 500 \\ \hline 1500 \end{array}$$

4. What is the sum of the first and last of 1000 numbers?

What number added to the cube of 10 will make the sum equal to 110 times 1000?

5. What number is that which being multiplied by 1000 the product will be equal to 1000000?

$$\begin{array}{r} 1000000 \\ \div 1000 \\ \hline 1000 \end{array}$$

6. Require the quotient of the square of 100 divided by half of its root.

7. A person possessed of a ship sold 2/3 of his share for 1200 what was the value of the whole ship at the same rate?

$$\begin{array}{r} 100 \\ \times 100 \\ \hline 10000 \end{array}$$

$$\begin{array}{r} 1200 \\ \times 3/2 \\ \hline 1800 \end{array}$$

1721

$\begin{array}{r} 30^2 \\ 30 \\ \hline 0900 \end{array}$

17
8
46
49

$\begin{array}{r} 20 \\ 75 \overline{) 1500} \\ \underline{150} \\ 0 \end{array}$

Promiscuus Austrius

15 / 100 captain and 100 sailors



1702
1.2
CD 216

Chrysomelids

of my father, which was the
114

26. *Staph. subsericeus* J. B. S.

*...the State of
...mine ... of the ...*

What is 1000×100 & what are
the values of $1000 \div 100$ & $100 \div 100$?

at the same rate as the other
~~pages~~ pages in the book.

$$\frac{201710}{201710} = \frac{10}{10}$$

Pembezurus Questions

11. There are two numbers the one is 10 the other is 20
 we have the product of these numbers and want the difference
 of their product and sum. Ans. 100. Difference 100

12. There are two numbers the one is 10 the other is 20
 we have the product of these numbers and want the difference
 of their product and sum. Ans. 100. Difference 100

13. Two men set at the same time from the same place but go
 in contrary ways and meet at 10 miles distance on Monday
 before the time in which they will have traveled over the
 distance if they were to go on.

14. A man has a number of apples which he divides
 into 5 equal parts and gives away 4 parts for
 many times until he has only 1 part left.
 How many apples did he have at first?

15. What number is that to which if you add 5 of
 itself the sum will be 20. Ans. 12.5

16. What number is that which being multiplied
 by 5 the product will be 25. Ans. 5

17. What number is that from which if you take
 5 the remainder will be 5. Ans. 10

18. What number is that which being multiplied
 by 5 the product will be 25. Ans. 5

What number is that whose half is equal to its square

287 What number is that whose half is equal to its square
 Dup 6

$$\frac{1}{2}x = x^2$$

$$36 : 3 : 6$$

$$34 \sqrt{18.065} \text{ Ans}$$

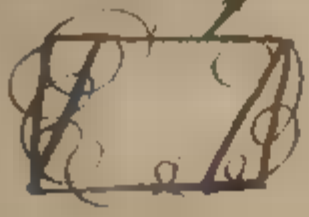
$$7 : 1 : 1 = \frac{1}{7}$$

$$12 : 1 : 1 = \frac{1}{12}$$

$$\frac{1}{7} \times \frac{1}{12} = \frac{19}{84}$$

$$19 : 1 : 184$$

45 How many acres are contained in a square field the diagonal of which is 20 perches more than either of its sides



$$2 \sqrt{1.414}$$

$$24 \sqrt{100}$$

$$281 \sqrt{4.00}$$

$$1.414 \text{ diagonal}$$

$$414 \text{ excess}$$

one root

$$414 : 1 : 20.48.3$$

$$2824 \sqrt{11900}$$

$$48.3$$

$$48.3$$

$$1449$$

$$3864$$

$$40 \sqrt{233.28.9}$$

$$14 \sqrt{58=12}$$

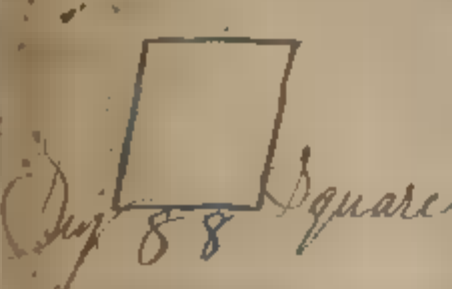
$$14-2=12 \text{ Ans. nearly}$$

44)

$$\begin{array}{r} 18 \overline{) 1100} \\ \underline{20} \\ 2000 \\ \underline{12} \\ 18 \overline{) 24000} \end{array}$$

$$18 \overline{) 24000} 1333.33$$

$$\begin{array}{r} 2144^2 + 303030^2 \\ \underline{44} \\ 1936 \end{array}$$



$$\begin{array}{r} 2 \overline{) 88} \\ \underline{44} \end{array}$$

$$\begin{array}{r} 44 \overline{) 1333.33} \\ \underline{132} \\ 133 \\ \underline{132} \\ 1 \end{array}$$

$$\begin{array}{r} 2884.09 \\ \underline{25} \\ 103 \overline{) 354} \\ \underline{309} \\ 1064 \overline{) 4509} \\ \underline{4256} \end{array}$$



$$\begin{array}{r} 53.42 \\ \underline{106.84} \end{array}$$

10682

453

$$\begin{array}{r} 2 \overline{) 1160} \\ \underline{80} \\ 64 \overline{) 1600} \\ \underline{132} \\ 1785 \overline{) 9900} \\ \underline{8925} \end{array}$$

$$\begin{array}{r} 1.128 \\ \underline{8.95} \\ 5640 \\ \underline{10132} \\ 9024 \\ \underline{2100936} \\ 50468 \\ \underline{8 \frac{1}{2}} \\ 252840 \\ \underline{2528} \\ 24.45 \text{ Ans} \end{array}$$

48

$$\begin{array}{l} (\frac{5^2}{4}) = \frac{25}{16} \\ (\frac{7^2}{8}) = \frac{49}{64} \end{array}$$

$$\begin{array}{r} 20 \\ \underline{72} \\ 240 \\ \underline{25} \\ 1200 \\ \underline{480} \\ 6000 \\ \underline{64} \end{array}$$

$$\begin{array}{r} 50 \\ \underline{10} \\ 600 \\ \underline{16} \\ 9600 \\ \underline{49} \\ 86400 \\ \underline{38400} \\ 1120 \end{array}$$

$$384000 : 1120 = 470400$$

50

$$\begin{array}{r} 24 \\ \underline{9} \\ 216 \overline{) 6 \times 4} \\ \underline{216} \\ 8 \\ \underline{8} \\ 64 \\ \underline{64} \\ 1360 \\ \underline{128} \\ 8 \\ \underline{96} \\ 103 \text{ Ans} \end{array}$$

$$\begin{array}{r} 384 \overline{) 526848.000} \\ \underline{384} \\ 1428 \\ \underline{1152} \\ 2764 \\ \underline{2688} \\ 768 \\ \underline{768} \end{array}$$

$$\begin{array}{r} 1372 \\ \underline{3 \frac{1}{2}} \\ 4116 \\ \underline{686} \\ 12 \overline{) 4802} \\ \underline{20} \\ 20 = 0 = 2 \end{array}$$

Ans

gall
500 qt
295 = 1
204 = 3 water

$$\begin{array}{r}
 34 \overline{) 1032} \quad (3 = 1\frac{10}{17} \text{ Ans} \\
 \underline{102} \\
 120 \\
 \underline{102} \\
 180 \\
 \underline{180} \\
 0
 \end{array}$$

$$\begin{array}{r} 5 = A \\ 7 = B \\ 10 \frac{1}{2} = C \\ \hline 22 \frac{1}{2} \text{ Quarts} \end{array}$$

$$\begin{array}{l} 1 \times 6 = 6 \\ 3 \times 8 = 24 \\ 6 \times 16 = 96 \end{array}$$

$$\begin{array}{r}
 126 : 18 = 7 \\
 \underline{18} \\
 126 - 18 = 108 \\
 \underline{108} \\
 108 - 18 = 90 \\
 \underline{90} \\
 90 - 18 = 72 \\
 \underline{72} \\
 72 - 18 = 54 \\
 \underline{54} \\
 54 - 18 = 36 \\
 \underline{36} \\
 36 - 18 = 18 \\
 \underline{18} \\
 18 - 18 = 0
 \end{array}$$

$$\begin{array}{r} 126 \overline{) 1890} : 6 \\ 126 \overline{) 1890} \\ \underline{126} \\ 630 \\ \underline{630} \\ 0 \end{array}$$

126:18.90:96
96

$$\begin{array}{r} 11940 \\ 17010 \\ \hline 126 \overline{) 181440} \quad (1440 \\ \underline{126} \\ 554 \\ \underline{504} \\ 504 \\ \underline{504} \\ 0 \end{array}$$

| | | |
|----|-----------|-------|
| 6 | 90 | |
| | <u>15</u> | boys |
| 8 | 360 | |
| | <u>45</u> | women |
| 16 | 1440 | |
| | <u>90</u> | men |
| | | 1890 |

Proof

(68)

$$\begin{array}{r} 9.5 \\ 6.75 \\ \hline 2.75 : 1 : : \end{array} \quad \begin{array}{r} 4.8 = 2 \\ 1.2 \\ \hline 546.75 \\ 539.25 \end{array}$$

$$\begin{array}{r} 275 \overline{) 539.25} \quad 196 \frac{1}{11} \text{ Days} \\ \underline{275} \\ 2642 \\ \underline{2475} \\ 1675 \\ \underline{1650} \\ 25 \end{array} \quad \begin{array}{r} 25 \overline{) 25} = 11 \end{array}$$

(69)

$$\begin{array}{r} 2 \overline{) \frac{1}{2} \frac{1}{5} \frac{1}{8} \frac{1}{9}} \\ \underline{15} \quad 49 \\ 20 \\ \underline{180} \end{array}$$

$$\begin{array}{r} 2 \quad 360 = 180 \\ 5 \quad 72 \\ 8 \quad 45 \\ 9 \quad 40 \end{array}$$

$$\begin{array}{r} 360 \\ 360 \end{array} - \begin{array}{r} 337 \\ 360 \end{array} = \begin{array}{r} 23 \\ 360 \end{array}$$

$$23 : 1 : 360$$

$$\begin{array}{r} 360 \\ 46 \\ \hline 2160 \\ 1440 \\ \hline 23 \overline{) 16560} \quad 720 \\ \underline{46} \\ 46 \\ \hline 0 \end{array} \quad \text{Ans}$$

(70)

$$\begin{array}{r} \text{Sup } 200 \quad 204 \\ 94 \\ \hline 10 \overline{) 1800} \\ \underline{180} \\ 168.2 \\ \hline 10 \overline{) 106} \\ \underline{53} \\ 53 \\ \underline{01.2} \\ 94 \\ \hline 168.2 \end{array}$$

Sup 100

$$\begin{array}{r} 100 \quad 104 \\ 94 \\ \hline 10 \overline{) 1500} \\ \underline{90} \\ 60 \\ \hline 10 \overline{) 6} \\ \underline{3} \\ 3 \\ \hline 1.2 \\ 94 \\ \hline 98.2 \\ 90 \\ \hline 8.2 \text{ er} \end{array}$$

$$100 \quad 8.2 \text{ er}$$

$$\begin{array}{r} 8.2 \\ 2.00 \\ \hline 16400 \\ 1180 \end{array} \quad \begin{array}{r} 11.8 \\ 100 \\ \hline 11800 \end{array}$$

$$\begin{array}{r} 20 \overline{) 2820} \\ \underline{141} \end{array} \quad \text{Ans}$$

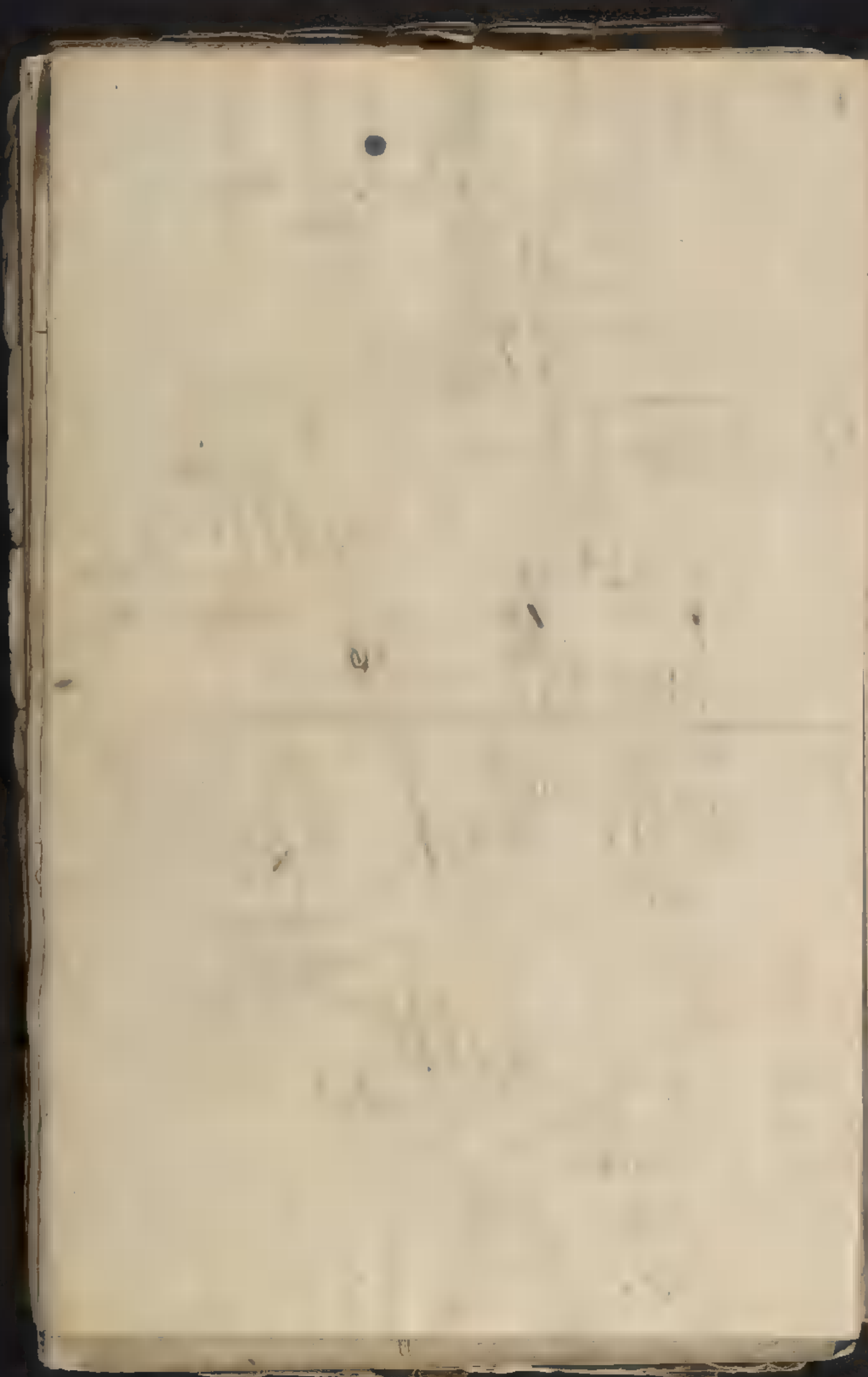
(72)

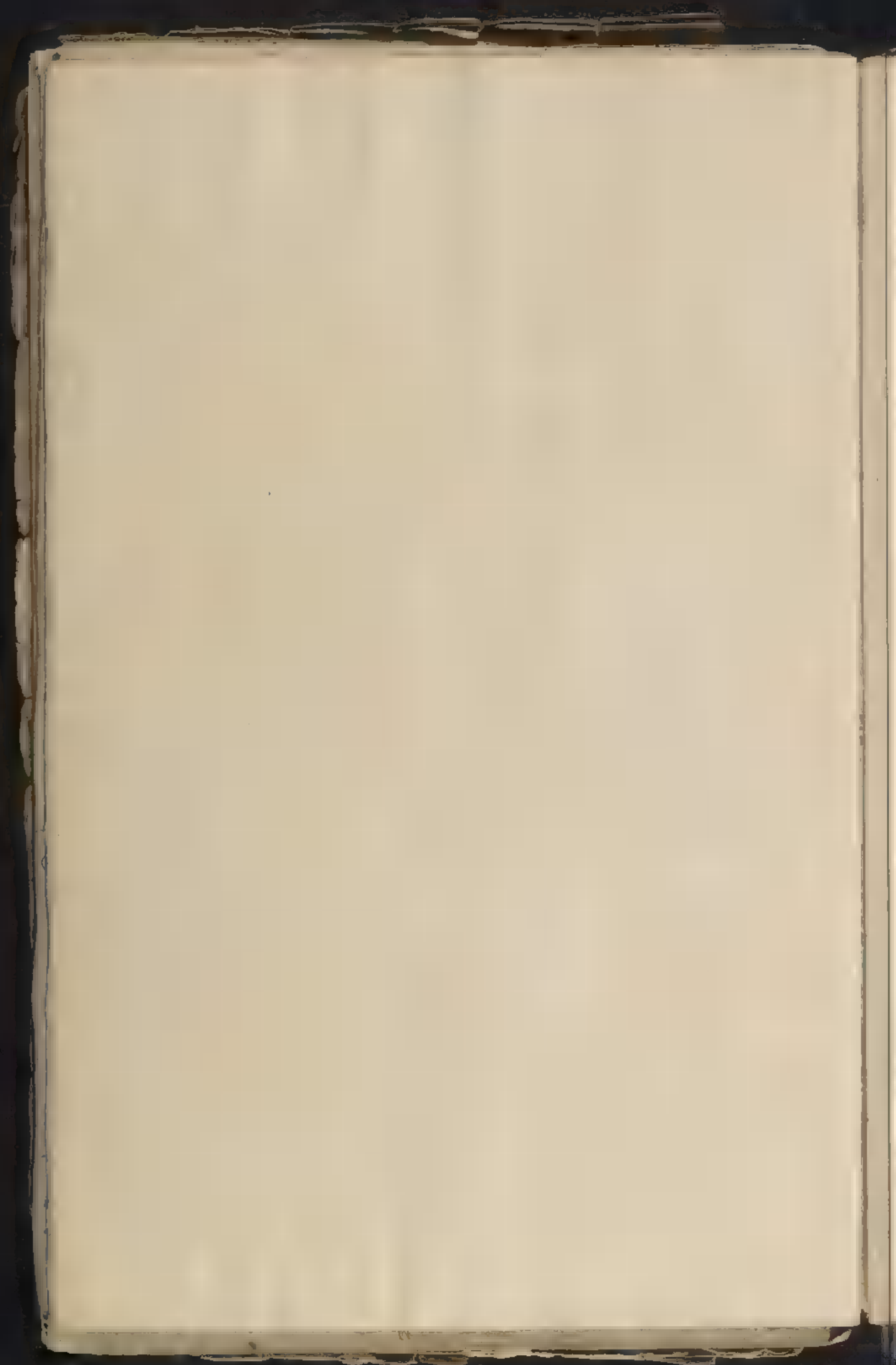
$$\begin{array}{r} 4 \\ 8 \\ \hline 12 \\ 2 \\ \hline 24 \text{ er} \end{array}$$

$$\begin{array}{r} 4 \\ 8 \quad 24 \\ \hline \text{inner 1 er.} \end{array}$$

$$\begin{array}{r} 3.14+ \\ 24 \\ \hline 1256 \\ 625 \\ \hline 75.06 \end{array} \quad \begin{array}{r} 3.14+ \\ 16 \\ \hline 18.84 \\ 314 \\ \hline 50.24 \end{array}$$

$$\begin{array}{r} \text{outer} \\ 75.06 \end{array} \quad \begin{array}{r} \text{inner} \\ 50.24 \end{array}$$





Simple Equations

Q. 1. A state is divided among four children in such a manner that the first has 200 more than the second, the second has 100 more than the third, the third has 50 more than the fourth, the fourth has 100 more than the fifth, and the value of the estate is 4500.

$$x + 200 + x + 100 + x + 50 + x + 100 = 4500$$

$$4x + 450 = 4500$$

$$4x = 4500 - 450 = 4050$$

$$x = \frac{4050}{4} = 1012\frac{1}{2}$$

$$x = 1012\frac{1}{2}$$

Q. 2. A number is such that if it is divided by 5, the remainder is 40.

$$5x - 40 = 0$$

$$5x = 40$$

$$x = \frac{40}{5} = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

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$$x = 8$$

Q. 3. A number is such that if it is divided by 5, the remainder is 40.

$$5x - 40 = 0$$

$$5x = 40$$

$$x = \frac{40}{5} = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

$$x = 8$$

Simple Equations

Prob 13 What number is that which is to 12 increased by 3 times the number as 2 to 9

$$x : 12 + 3x :: 2 : 9 \quad 14$$

$$9x = 24 + 6x$$

$$9x - 6x = 24$$

$$3x = 24$$

$$x = 8$$

A ship and a boat are descending a river at the same time, the ship passes a certain fort when the boat is 15 miles down below. The ship descends 5 miles while the boat descends 3 at what distance below the fort will they be together.

Ans 33 1/2

$$x : x - 15 :: 5 : 3 \quad 15$$

$$5x - 65 = 3x$$

$$5x - 3x = 65$$

$$2x = 65$$

$$x = 32 1/2$$

part of wood an eighth of it is 2

Ans 108

What number is that which is to 12 increased by 3 times the number as 2 to 9

Ans 8

What number is that which is to 12 increased by 3 times the number as 2 to 9

Ans 8

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What number is that which is to 12 increased by 3 times the number as 2 to 9

Ans 8

Simple Equations B. H.

20 What number is that $\frac{1}{2}$ of which is greater than $\frac{1}{3}$ of it by 96 Ans 1920

$$\begin{array}{r} x - \frac{x}{2} = 96 \\ 2x - 1920 = 1920 \\ x = 1920 \end{array}$$

21 A post is $\frac{1}{4}$ in the earth $\frac{1}{3}$ in the water and 13 ft above the water what is the length of the post Ans 55 ft

$$\begin{array}{r} \frac{x}{4} + \frac{x}{3} + 13 = x \\ 3x + 4x + 156 = 12x \\ 7x = 156 \\ x = 22 \frac{2}{7} \end{array}$$

22 What number is that to which 10 being added $\frac{3}{4}$ of the sum will be 66 Ans 100

$$\begin{array}{r} x + 10 = 30 + 30 \\ 100 \\ 110 \\ 120 \end{array}$$

23 Of the trees of an orchard $\frac{1}{4}$ are apple trees $\frac{1}{3}$ pear trees and the remainder peach trees which are 20 more than $\frac{1}{2}$ of the whole what is the whole number of the orchard

$$\begin{array}{r} 40 + 32 + 110 = 640 - 320 \\ 90 = 640 - 320 \\ 90 = 320 \\ x = 800 \end{array}$$

24 I had some money and I gave $\frac{1}{4}$ of it to a friend and $\frac{1}{3}$ of the remainder to another friend and I had 160 left what was the money I had at first Ans 480

$$\begin{array}{r} 240 - 60 = 180 \\ 180 - 60 = 120 \\ 120 - 40 = 80 \\ 80 - 20 = 60 \\ 60 - 10 = 50 \\ 50 - 10 = 40 \\ 40 - 10 = 30 \\ 30 - 10 = 20 \\ 20 - 10 = 10 \\ 10 - 10 = 0 \end{array}$$

25 A and B have the same income I contracted an annual debt amounting to $\frac{1}{4}$ of A's income and $\frac{1}{3}$ of B's income and if he gave B lands to pay off his debt and has 160 left what is the income of each

$$\begin{array}{r} x \times \frac{1}{4} = 100 \\ x \times \frac{1}{3} = 100 \\ x = 400 \end{array}$$

$$\begin{array}{r} 2x - 100 = 160 \\ 2x = 260 \\ x = 130 \end{array}$$

Continued by Wth H. McCormick
 Prob 26 A gentleman lived single $\frac{1}{4}$ of his whole life and after having been married 15 years more than $\frac{1}{4}$ of his life he had a son who died 4 years before him and who reached $\frac{1}{2}$ the age of his father to what age did the father live Ans 84

Sup^{se} the age of father = x
 $\frac{x}{4} + \frac{x}{4} + 15 + \frac{x}{2} + 4 = x$
 $56x = 14x + 8x + 280 + 28x + 112$
 $56x - 14x - 8x - 28x = 280 + 112$
 $6 \frac{16x}{x} = 392 \quad \frac{392}{6} = 65 \frac{1}{3}$

27 What number is that of which if $\frac{1}{5}$ and $\frac{1}{4}$ be added together the sum will be 73 Ans 84

Sup^{se} $\frac{1}{5} + \frac{1}{4} + 2\frac{1}{4} = 73$

$2.8x + 21x + 24x = 6132$

$\frac{44x}{x} = 6132$
 $x = 84$

28 A person after spending 100 £ more than $\frac{1}{5}$ of his income had remaining 35 £ more than $\frac{1}{5}$ of it Remains his income at 145 £

Sup^{se} $\frac{1}{5} \text{ of } 100 = 20 + 35$

$100 - 20 = 80 = 50 + 30$

$100 - 20 = 80 = 50 + 30$

$\frac{100}{5} = 20$
 $100 - 20 = 80 = 50 + 30$

Prob 29 In the composition of a quantity of gunpowder the nitre was $\frac{1}{3}$ more than $\frac{1}{2}$ of the whole the sulphur $\frac{1}{4}$ less than $\frac{1}{2}$ of the whole the charcoal 2 lbs less than $\frac{1}{4}$ of the nitre What was the amount of the gunpowder

$\frac{2x + 10}{3} = \frac{2x + 30}{3} \times \frac{1}{4} = \frac{2x + 30}{12}$ Ans 84

Sup^{se} the composition of the whole $\frac{2x}{3} + 10 + \frac{x}{4} - \frac{x}{8} + \frac{2x + 30}{12} = x$

$\frac{2x}{3} + 10$ nitre

$504x + 7560 + 126x - 3402 + 72x + 1080 - 1512 = 711x$

$\frac{x}{4} - \frac{x}{8}$ Sulphur

$756x - 504x + 7560 + 126x - 3402 + 72x + 1080 - 1512$

$2x + 30 - 1$ charcoal

$716x - 504x + 126x - 72x = 7560 - 3402 + 1080 - 1512$

$\frac{21}{x}$

$\frac{1012}{x} \quad \frac{2040}{x} \quad \frac{1080}{x} \quad \frac{1512}{x}$

$5454x = 3726$

$\frac{3726}{5454} = \frac{1}{147}$

Ans 84

726

Continued By H. H. H.
 Prob 30

A cask which holds 146 cads was filled with a mixture of brandy wine and water. There were 15 galls of wine more than of brandy and as much water as the brandy and wine together. What quantity was there of each.

Qty of the brandy $4x = 146 - 50$
 wine $x + 15$ water $2x + 15 = 146$
 $4x + 3x + 15 = 146$
 $7x = 131$
 $x = 18 \frac{7}{7}$

Proof

31. Three persons purchased a farm in company for 4755 of which B paid three times as much as A, C paid as much as A and B and A paid as much as C and B. What did each pay.

Qty. What A pays $x + 3x + 4x = 4755$
 $8x = 4755$
 $x = 594 \frac{3}{8}$

Ans 594 317 1265 2211

32. It is required to divide the number 99 into 4 such parts that the first may exceed the second by 10 less than the third by 10 greater than the fourth by 9 and less than the 5 by 10. Ans 17

Let $x =$ the 1st part
 Then $x - 3 =$ the second
 $x + 10 =$ the third
 $x - 9 =$ the fourth
 $x + 10 =$ the 5th

$x + x - 3 + x + 10 + x - 9 + x + 10 = 99$
 $5x + 8 = 99$
 $5x = 91$
 $x = 18 \frac{1}{5}$

Ans 17

33

and a small

A father, a son and a daughter the third had 9 shillings more than the first the second had 11 shillings more than the first the first had 13 shillings more than the second and the whole sum was 8 shillings more than 7 times the sum the youngest received.

Suppose the parents share

Ans 15

$$\begin{array}{r}
 x + x + 9 + x + 21 + x + 39 = 7x + 6 \\
 7x + 6 = x + x + 9 + x + 21 + x + 39 \\
 7x - x - x - x - x = 9 + 21 + 39 - 6 \\
 4x = 53 \\
 x = 13 \frac{1}{4}
 \end{array}$$

34

A person has two plots of a shop each containing the same number of articles sold from one of these and from the other 9 the first gives as many remaining in the one as the other it can be seen that each plot contains

$$\begin{array}{r}
 2x + 6 = 39 \\
 x - 17 = x - 19 \\
 x - 17 = 20 - 18
 \end{array}$$

35

A person travels at the rate of 60 miles a day had been departed 12 days when a second was sent after him travelling at the rate of 75 miles a day what time will the second catch the other

$$\begin{array}{r}
 75x = 60x + 720 \\
 15x = 720 \\
 x = 48
 \end{array}$$

36

The age of A is double that of B the age of B is half that of C and the sum of all their ages 140 what is the age of each

Suppose the ages of A, B and C are

$$\begin{array}{r}
 10x + 5x + 20x = 140 \\
 35x = 140 \\
 x = 4
 \end{array}$$

Simple Equations

Two pieces of cloth of the same price by the yd but of different lengths were bought the sum of \$100 the other piece if it be added to the length of each the sums will be \$150 & required the length of each piece

Suppose the shorter piece

$$5 \text{ yds } 3 \text{ ft } 6 \text{ in}$$

$$10 \times 10 = 100 \text{ the longer}$$

$$x + 10 = 100 \text{ if } 5 \text{ yds } 3 \text{ ft } 6 \text{ in}$$

$$6 \times 100 = 600 \text{ } 6 \text{ yds } 3 \text{ ft } 6 \text{ in}$$

$$60 \times 100 = 6000 \text{ } 60 \text{ yds } 3 \text{ ft } 6 \text{ in}$$

$$600 \times 100 = 60000 \text{ } 600 \text{ yds } 3 \text{ ft } 6 \text{ in}$$

$$6000 \times 100 = 600000 \text{ } 6000 \text{ yds } 3 \text{ ft } 6 \text{ in}$$

$$60000 \times 100 = 6000000 \text{ } 60000 \text{ yds } 3 \text{ ft } 6 \text{ in}$$

$$600000 \times 100 = 60000000 \text{ } 600000 \text{ yds } 3 \text{ ft } 6 \text{ in}$$

A and B began trade with equal sums of money the first year A gained 40 lbs and B lost 40 the second year A lost 3 of what he had at the end of the first and B gained 40 lbs less than twice the sum which A lost B had then twice as much money as A what sum did each begin with

Suppose the whole sum x $\frac{1}{3} 140$ $\frac{1}{3} 40$ Ans 320 lbs

$$x + 40 = 140 \text{ As sum } 100 \text{ } 100 + 40 = 140$$

$$180 + 220 = 400 \text{ } 400 - 40 = 360 \text{ } 360 + 40 = 400$$

$$180 - 60 = 120 \text{ } 120 + 240 = 360 \text{ } 360 + 40 = 400$$

$$320 \text{ } 320 \text{ } 320 \text{ } 320$$

What number is that which being successively added to 31 and 32 will make the former sum equal to the latter as 1 to 2

$$\begin{array}{r} \text{Sup } x+31 : x+32 :: 1 : 2 \\ 4x+124 = 2x+64 \\ 4x-2x = 64-124 \\ 2x = -60 \\ x = -30 \end{array}$$

$$\begin{array}{r} 12+30 \\ 48-124 \\ 88 \\ 12+32 \\ 50+136 \\ 88 \\ 12+32 \\ 199 \end{array}$$

40 A gentleman bought a Chaise horse and harness for 560£ the horse cost twice as much as the harness and Chaise cost twice as much as the horse and harness together what was the price of each

$$\begin{array}{r} \text{Sup } x \text{ harness} \\ x \text{ horse} \\ x \text{ chaise} \\ 1x+2x+4x = 560 \\ 7x = 560 \\ x = 80 \end{array}$$

$$\begin{array}{r} 80 \text{ harness} \\ 160 \text{ horse} \\ 320 \text{ chaise} \\ 560 \end{array}$$

41 Out of a cask of wine from which had leaked 3 pints 21 casks were it required to know how much the cask was found to keep full how much did the cask hold

$$\begin{array}{r} \text{Sup } x \text{ cask} \\ x+11 = 3 \\ 2x+22 = 3x \\ 2x-2x = 3-22 \\ x = -19 \end{array}$$

$$\begin{array}{r} 21 \text{ pints} \\ 11 \\ 73 \\ 174 \end{array}$$

42 A man has 6 sons each of whom is 2 years older than his next youngest brother and the eldest is the times ~~thirteen~~ as old as the youngest what is the age of the eldest

$$\begin{array}{r} x+20 = 3x \\ x-3x = -20 \\ 2x = 20 \\ x = 10 \end{array}$$

$$\begin{array}{r} 10 \text{ years} \\ 4 \text{ years} \\ 14 \text{ years} \\ 16 \text{ years} \\ 18 \text{ years} \\ 20 \text{ years} \end{array}$$

Simple Equations by 2

43 Divide the number 49 into two such parts that the greater increased by 6 shall be to the less diminished by 11 as 7 to 5

$$\begin{array}{l} x+6 : 49-x-11 :: 7 : 5 \\ 5x+30 = 343-49x+55 \\ 50x = 313-30 \\ 50x = 283 \\ x = 5.66 \end{array}$$

44 What two numbers are as 2 to 5 to each of which 4 is added the sum will be as 3 to 7

$$\begin{array}{l} x+4 : y+4 :: 2 : 5 \\ 5x+20 = 2y+8 \\ 5x-2y = -12 \\ 10x-4y = -24 \\ 10x-4y = -24 \\ 10x-4y = -24 \end{array}$$

45 A person bought two casks of putty one of which cost as much as the other from each of which he drew 4 galls and then found that there were 4 times as many galls remaining in the larger as in the other how many were there in each

$$\begin{array}{l} x-4 : y-4 :: 4 : 1 \\ 4x-16 = 4y-16 \\ 4x-4y = 0 \\ x=y \end{array}$$

46 Divide the number 68 into two such parts that the difference of one the greater and 84 shall be equal to 5 times the difference between the less and 40

Ans 42 the greater 26 the less

Suppose the greater

68 - x the less

$$84 - x = 40 - 68 + x$$

$$84 - x = 120 - 264 + 3x$$

$$\frac{33x - x}{40} = \frac{288}{120}$$

$$412x = 168 \text{ the greater}$$

$$\begin{array}{r} 68 \\ 42 \\ \hline 110 \end{array} \text{ the less}$$

$$\begin{array}{r} 84 \\ 44 \\ \hline 128 \end{array} \text{ the greater}$$

117 Three places are situated in the order of the letters A B C. The distance from A to C is 4 miles the distance from A to B is to the distance from C to B as 3 to 5 and 1/2 of the distance from A to B added to 1/2 the distance from C to B is three times the distance from B to C. What are the respective distances.

Suppose from A to B 12, B to C 18

$$2:3 :: x:18 \quad AB = x \quad BC = 18$$

$$2:3 :: 12:18$$

$$\frac{x}{4} + \frac{3x}{4} = 6x + 12x + 18x = 204$$

$$\frac{x}{4} + \frac{3x}{4} = \frac{4x}{4} = x \quad 17 \frac{1}{2} x = 204 \quad x = 12 \quad AB$$

$$\begin{array}{r} 12 \quad AB \\ 18 \quad BC \\ \hline 30 \quad \text{Sum} \end{array}$$

118 Divide the number 36 into 3 such parts that 1/2 of the first 1/3 of the second and 1/4 of the third shall be equal to each other.

Suppose the first number

$$x + 3x + 12 = 36$$

the second

$$2x + 12 = 72$$

the third

$$9x + 12 = 112$$

$$\begin{array}{r} 12 \\ 12 \\ \hline 24 \end{array}$$

Simple Equations by 117

A merchant supported himself 5 years for 100
 at the end of each year added
 that part of his stock which was not thus
 expended a sum equal to 1/5 of this part at the
 end of the 5th year his original stock was
 doubled what was that stock Ans 14000

Sup. the stock

$$x - 50 + x - 50 + x - 50 + x - 50 + x - 50 = 2x$$

$$x - 150 + x - 150 + x - 150 + x - 150 + x - 150 = 2x$$

$$x - 650 + x - 500 + x - 400 + x - 300 + x - 200 = 2x$$

$$x - 150 + 120 - 100 + 80 - 50 = 2x$$

$$x - 150 + 270 - 350 = 2x$$

$$270 - 400 + 370 - 350 = 540$$

$$540 = 270 - 270 = 540 - 350$$

$$540 - 270 = 270 = 400 - 350$$

$$270 = 400 - 130$$

$$130 = 400 - 270$$

not having lost a battle found that he had
 1/3 of his army 13000 men left fit for action 1/5
 of the army 4000 men being wounded and the rest
 were 1/3 of the whole either slain taken prisoner
 being ~~retreated~~ missing of how many men did his
 army consist Sup. the army Ans 24000

$$x - 13000 + x - 4000 = x$$

$$x + 28800 + 10x + 4800 + 16x = 80x$$

$$80x = 40x + 28800 + 10x + 4800 + 16x$$

$$40x = 40x + 28800 + 10x + 4800 + 16x$$

$$40x - 40x - 10x - 16x = 28800 + 4800$$

$$-66x = 33600$$

$$x = 50800$$

$$x = 24000$$

11 Powers Continued

4 Reduce $\frac{8a^3y - 11a^2y^2 + 6ay^3}{4a^2y + 4a^2y^2} = \frac{4a^2 - 11ay + 6y^2}{4a^2 + 4ay}$ Ans

6 Reduce $\frac{2a^4}{3a^3}$ and $\frac{a^2}{a^2}$ to a common denominator

$$\frac{2a^4 \times a^2}{3a^3 \times a^2} = \frac{2a^6}{3a^5}$$

$$\frac{a^2 \times a^2}{a^2 \times a^2} = \frac{a^4}{a^4}$$

Ans $\frac{2a^6}{3a^5} - \frac{a^4}{a^4} = \frac{2a^6 - 3a^4}{3a^5}$

8 Multiply $a^2 + b$ into $a - b$

$$\begin{array}{r} a^2 + b \\ a - b \\ \hline a^3 - ab^2 \end{array}$$

Ans

9 Multiply $\frac{a^2 + 1}{x^2}$ into $\frac{b^2 - 1}{x + a}$

$$\frac{a^2 + 1}{x^2} \times \frac{b^2 - 1}{x + a} = \frac{a^2b^2 - 1}{x^2 + ax^2}$$

Ans

10 Multiply $\frac{b^4}{a^2}$ into $\frac{b^3}{x}$ and $\frac{a^2}{y}$

$$\frac{b^4}{a^2} \times \frac{b^3}{x} \times \frac{a^2}{y} = \frac{b^7}{xy}$$

Ans

12 Divide $\frac{a^2x^4}{a^2}$ by $\frac{x^2 - a^2}{a^2}$

$$\frac{a^2x^4}{a^2} \div \frac{x^2 - a^2}{a^2} = \frac{a^2x^4}{a^2(x^2 - a^2)} = \frac{x^4}{x^2 - a^2}$$

Ans

13 Divide $\frac{b - y^{-1}}{y}$ by $\frac{a^2 + b^{-4}}{y^2}$

$$\frac{b - y^{-1}}{y} \div \frac{a^2 + b^{-4}}{y^2} = \frac{(b - y^{-1}) \times y^2}{y(a^2 + b^{-4})} = \frac{by^2 - y}{a^2y + b^{-4}y}$$

Ans

14 Divide $\frac{b^2 - 1}{d^4}$ by $\frac{d^2 + 1}{d}$

$$\frac{b^2 - 1}{d^4} \div \frac{d^2 + 1}{d} = \frac{(b^2 - 1) \times d}{d^4(d^2 + 1)} = \frac{b^2d - d}{d^6 + d^4}$$

Ans

Radical Quantities

7 Reduce $a^{\frac{1}{2}}$ and $b^{\frac{1}{2}}$

$$\frac{1 \times 5 = 5}{5 \times 3 = 15} = \frac{b^{\frac{5}{15}} a^{\frac{3}{15}}}{(Ans)}$$

8 Reduce $x^{\frac{1}{2}}$ and $5^{\frac{1}{2}}$

$$\frac{x^{\frac{1}{2}} \quad 5^{\frac{1}{2}}}{3 \times 1 = 3} \quad \frac{1 \times 2 = 2}{3 \times 2 = 6} \text{ len } 1$$

$$5^{\frac{2}{6}} x^{\frac{3}{6}} \text{ (Ans)}$$

9 Reduce $\sqrt[3]{64b^3}$

10 Multiply 5×5 into 30 Ans 150

$$\begin{array}{r} 150 \\ 315 \\ \hline 18150 \end{array} \quad \begin{array}{r} 14 \times 110 \\ 15 \times 2 \times 110 \\ \hline 30110 \end{array} \text{ (Ans)}$$

11 Multiply 10×3 into 30 4

$$\begin{array}{r} 2 \times 1 = 2 \\ 3 \times 1 = 3 \\ 3 \times 2 = 6 \text{ remaining} \end{array}$$

$$2 \sqrt{3} \times 3 \sqrt{4} = 6 \sqrt{12}$$

$$\begin{array}{r} 9 \sqrt{12} \\ - 3 \sqrt{12} \\ \hline 6 \sqrt{12} \end{array} \text{ (Ans)}$$

12 Multiply $7 \sqrt{d}$ into $3 \sqrt{4}$

$$\begin{array}{r} 3 \times 1 = 3 \\ 2 \times 1 = 2 \\ 3 \times 2 = 6 \end{array}$$

$$\begin{array}{r} \sqrt[3]{d^3} \\ \sqrt[3]{a^3 b^3} \\ \hline \sqrt[3]{a^3 b^3 d^3} \text{ (Ans)} \end{array}$$

13 Multiply $\sqrt{\frac{2ab}{3c}}$ into $\sqrt{\frac{2ad}{3c}}$ Ans $\sqrt{\frac{3a^2 d}{c}}$

$$\frac{2ab}{3c} \times \frac{2ad}{3c} = \frac{4a^2 bd}{9c^2}$$

$$\sqrt{\frac{4a^2 bd}{9c^2}} = \frac{2a \sqrt{bd}}{3c} \text{ (Ans)}$$

$$\frac{c-d \times \sqrt{aa}}{a \sqrt{a-x}} \quad \frac{(ac-ad)}{(a^2x-ax^2)}$$

14 Multiply $aca - cd^2$ into $(c-d) \times (ca+d)$

(Answer)

15 See Remarks

Division of Radicals

Divide $ab(x^2b)^{\frac{1}{4}}$ by $(x)^{\frac{1}{2}}$

$$\begin{array}{r} \frac{1}{2} \quad \frac{1}{4} \\ 2 \times 1 = 2 \quad 2 \quad 4 \\ 4 \times 1 = 4 \quad 8 \quad 8 \\ 2 \times 1 = 8 \text{ to } \frac{1}{4} \quad \frac{2}{4} \end{array}$$

$$\frac{ab(x^2b)^{\frac{1}{4}}}{a(x)^{\frac{1}{2}}} = 4b^{\frac{1}{4}} \text{ Ans}$$

1 Divide $27bc$ by $3\sqrt{ac}$

$$\begin{array}{r} \frac{1}{3} \quad \frac{1}{2} \\ 3 \times 1 = 3 \\ 2 \times 1 = 2 \\ 3 \times 2 = 6 \text{ to } 6 \end{array}$$

$$\frac{27bc}{3\sqrt{ac}} = 9\sqrt{\frac{b^2c^2}{a^3c}} = 3\sqrt{\frac{b^2c}{a^3}} \text{ Ans}$$

2 Divide 108108 by 514

$$\begin{array}{r} 108108 \\ 514 \overline{) 108108} \\ 514 \overline{) 108108} \\ 1127 \text{ to } 3 \end{array}$$

3 Divide 10127 by 113

$$\begin{array}{r} 10127 \\ 113 \overline{) 10127} \\ 113 \overline{) 10127} \\ 51 \text{ to } 3 \end{array}$$

4 Divide 81108 by 216

$$\begin{array}{r} 81108 \\ 216 \overline{) 81108} \\ 216 \overline{) 81108} \\ 41 \text{ to } 15 \end{array}$$

$$\sqrt{9} \times \sqrt{2} = 4 \times 3 \times 12 = 12 \sqrt{2} \text{ Ans}$$

5 Divide $(a^2b^3d)^{\frac{1}{2}}$ by $d^{\frac{1}{2}}$

$$\begin{array}{r} \frac{1}{2} \quad \frac{1}{2} \\ 6 \times 1 = 6 \\ 2 \times 1 = 2 \\ 1 \times 6 = 6 \text{ to } 6 \end{array}$$

$$\frac{(a^2b^3d)^{\frac{1}{2}}}{(d^{\frac{1}{2}})^{\frac{1}{2}}} = (ab)^{\frac{1}{2}} \text{ Ans}$$

6 Divide $(16a^5 - 12a^2x)^{\frac{1}{2}}$ by $2a$

$$\begin{array}{r} (16a^5 - 12a^2x)^{\frac{1}{2}} \\ 2a \overline{) (16a^5 - 12a^2x)^{\frac{1}{2}}} \\ (4a - 3x)^{\frac{1}{2}} \text{ Ans} \end{array}$$

Evolution Radical

Required the cube root of $a - \sqrt{b}$

$$\begin{array}{r} a - \sqrt{b} \\ \hline a^3 - a^2\sqrt{b} \\ a^2 = a\sqrt{b} + b \\ \hline \end{array}$$

$$\begin{array}{r} a^3 - a^2\sqrt{b} - 6ab + a^3 - 2a^2\sqrt{b} + ab \\ \hline 7a^3 - 3a^2\sqrt{b} - 5ab + a^3 - 2a^2\sqrt{b} + ab \\ \hline \end{array}$$

Required the cube of $2d + \sqrt{x}$

$$\begin{array}{r} 2d + \sqrt{x} \\ \hline 4d + 2d\sqrt{x} \\ \hline 4d + 2d\sqrt{x} \\ \hline 4d + 4d\sqrt{x} + x \\ \hline 4d\sqrt{x} + 4d\sqrt{x} + x \\ \hline 4d\sqrt{x} + 6d\sqrt{x} + x \\ \hline \end{array}$$

Q 3d. 1 The fractions $\frac{6}{5^4} = \frac{6 \times 5^4}{5^4 + 5^4} = \frac{6}{5} \sqrt[4]{5^3}$ Ans

8 The Fractions $\frac{8}{\sqrt{3} + \sqrt{2} + 1} = \frac{8(\sqrt{3} - \sqrt{2} - 1)(-\sqrt{2})}{(\sqrt{3} + \sqrt{2} + 1)(\sqrt{3} - \sqrt{2} - 1)(-\sqrt{2})}$

| | | |
|--|---|------------|
| $\begin{array}{r} \sqrt{3} + \sqrt{2} + 1 \\ \sqrt{3} + \sqrt{2} - 1 \\ \hline -\sqrt{3} - \sqrt{2} - 1 \\ -\sqrt{6} - \sqrt{2} - 2 \\ \hline \sqrt{3} \\ 3 + \sqrt{6} \\ \hline 3 - 2\sqrt{2} - 8 \\ \hline \sqrt{6} \\ 2\sqrt{4} = -4 \end{array}$ | $\begin{array}{r} \sqrt{3} - \sqrt{2} - 1 \\ \hline 8\sqrt{3} - 8\sqrt{2} - 8 \\ \hline -\sqrt{2} \\ 4\sqrt{6} + 8\sqrt{4} + 8\sqrt{2} \\ \hline 2\sqrt{6} + 2\sqrt{4} + 2\sqrt{2} = 4 - 2\sqrt{6} + 2\sqrt{2} \\ \hline 2\sqrt{4} = 4 \end{array}$ | <p>Ans</p> |
|--|---|------------|

9 Reduce $\frac{2}{\sqrt{3}}$ to a fraction having a Rational Denominator

$$\begin{array}{r} \frac{2}{\sqrt{3}} \quad \frac{2 \times \sqrt{3}}{\sqrt{3} - \sqrt{3}} \quad \frac{\sqrt{3}}{\sqrt{3}} \\ \hline \frac{2\sqrt{3}}{3} \quad 2\sqrt{3} = 3 \\ \hline \frac{2\sqrt{3}}{3} \text{ Answer} \end{array}$$

10 Reduce $\frac{a\sqrt{b}}{a+\sqrt{b}}$ to a fraction having a rational Denominator

$$\frac{a-\sqrt{b}}{a+\sqrt{b}} \cdot \frac{a-\sqrt{b}}{a-\sqrt{b}} = \frac{a-\sqrt{b}}{a+\sqrt{b}} \times \frac{a-\sqrt{b}}{a-\sqrt{b}}$$

$$\frac{a^2 - a\sqrt{b}}{a^2 - b}$$

$$\frac{a^2 - a\sqrt{b} + b}{a^2 - b} \text{ Ans } \frac{a^2 - a\sqrt{b} - b}{a^2 - b}$$

Examples for Practice

Find the 4th root of $81a^2$

$$81a^2 = 3^4 a^2 = 3^4 a^{\frac{2}{4}} = 3^4 a^{\frac{1}{2}}$$

Ans $3\sqrt{a}$ 4th root

2 Find the 6th root of $(a+b)^{-3}$

$$(a+b)^{-\frac{3}{6}} = (a+b)^{-\frac{1}{2}}$$

Ans $(a+b)^{-\frac{1}{2}}$ Answer

3 Find the n^{th} root of $(x-y)^{\frac{1}{2}}$

$$\frac{1}{2} \div n = \frac{1}{2} \times \frac{1}{n} = \frac{1}{2n}$$

n^{th} root of $(x-y)^{\frac{1}{2}} = (x-y)^{\frac{1}{2n}}$ Ans

4 Find the cube root of $-125ax^6$

$$\sqrt[3]{-125x^6} \sqrt[3]{a} = -5x^2 \sqrt[3]{a} \text{ Ans}$$

5 Find the square root of $\sqrt[3]{\frac{4a^4}{9x^2y^2}}$

$$\sqrt[3]{\frac{4a^4}{9x^2y^2}} = \sqrt{\frac{2a^2}{3xy}} \text{ Ans}$$

6 Find the square root of $\frac{32a^5x^{10}}{243}$

$$\sqrt{\frac{32a^5x^{10}}{243}} = \frac{\sqrt{32}a^{\frac{5}{2}}x^5}{\sqrt{243}} = \frac{4a^{\frac{5}{2}}x^5}{3\sqrt{3}} \text{ Ans}$$

7 Find the square root of $x^2 - 6bx + 9b^2$

$$x^2 - 6bx + 9b^2 = (x-3b)^2$$

Ans $x-3b$

8 Find the square root of $a^2 + ay + \frac{y^2}{4}$

$$a^2 + ay + \frac{y^2}{4} = \left(a + \frac{y}{2}\right)^2$$

Ans $a + \frac{y}{2}$

Radical Quantities by 3

Reduce ac^2 to the form of the 6th root

$$\sqrt[6]{a^2 c^4} \text{ Ans}$$

10 Reduce $3y$ to the form of the cube root $\sqrt[3]{-27y^3} \text{ Ans}$

11 Reduce a^2 and a^3 to a common index
 $a^2 \quad a^3 \quad (a^2)^{\frac{3}{2}} \quad (a^3)^{\frac{2}{3}} \text{ Ans} \quad \frac{2}{1} \quad \frac{1}{3} \quad \begin{matrix} 2 \times 3 = 6 \\ 1 \times 1 = 1 \\ 1 \times 3 = 3 \end{matrix} \text{ Com}$

12 Reduce $4^{\frac{1}{3}}$ and $5^{\frac{1}{4}}$ to a common index
 $\frac{1}{3} \quad \frac{1}{4} \quad \begin{matrix} 1 \times 4 = 4 \\ 3 \times 1 = 3 \\ 3 \times 4 = 12 \end{matrix} \text{ Com. index} \quad \sqrt[12]{4^4} \quad \sqrt[12]{5^3} \text{ Ans}$

13 Reduce $a^{\frac{1}{8}}$ and $b^{\frac{1}{4}}$ to the common index 8
 $\frac{1}{8} \div \frac{1}{2} = \frac{1}{4} \times \frac{1}{2} = \frac{1}{8} = 1$
 $\frac{1}{8} \div \frac{1}{4} = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8} = 2$
 $\sqrt[8]{a^4} \quad \sqrt[8]{b^2} \text{ Ans}$

14 Reduce $2^{\frac{1}{8}}$ and $4^{\frac{1}{4}}$ to the common index 8
 $\frac{1}{8} \div \frac{1}{2} = \frac{1}{4} \times \frac{1}{2} = \frac{1}{8} = 1$
 $\frac{1}{8} \div \frac{1}{4} = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8} = 2$
 $\sqrt[8]{2^4} \quad \sqrt[8]{4^2} \text{ Ans}$

15 Remove a factor from $\sqrt{294}$ $\sqrt{49} \times \sqrt{6}$
 $\sqrt{49} \times \sqrt{6} \text{ Ans}$

16 Remove a factor from $\sqrt{x^3 - a^2 x}$ $\sqrt{x^2} \times \sqrt{x - a^2}$
 $\times \sqrt{x - a^2} \text{ Ans}$

17 Remove a factor
 Find the sum and difference of $\sqrt{6a^2 x}$ and $\sqrt{4a^2 x}$
 $\begin{array}{r} \sqrt{6a^2 x} \\ 4a\sqrt{x} \end{array} \quad \begin{array}{r} 4a\sqrt{x} \\ 2a\sqrt{x} \end{array} \quad \begin{array}{r} 4a\sqrt{x} \\ 2a\sqrt{x} \end{array} \quad \begin{array}{r} \sqrt{4a^2 x} \\ 2a\sqrt{x} \end{array}$
 $2a\sqrt{x} \quad \text{Diff} \quad 6a\sqrt{x} \quad \text{Sum}$

18 Find the sum and Difference of $\sqrt[3]{92}$ and $\sqrt[3]{24}$
 $\begin{array}{r} \sqrt[3]{92} \\ 4\sqrt[3]{23} \end{array} \quad \begin{array}{r} 4\sqrt[3]{23} \\ 2\sqrt[3]{23} \end{array} \quad \begin{array}{r} 4\sqrt[3]{23} \\ 2\sqrt[3]{23} \end{array} \quad \begin{array}{r} \sqrt[3]{24} \\ 2\sqrt[3]{3} \end{array}$
 $6\sqrt[3]{23} \text{ Sum} \quad 2\sqrt[3]{3} \text{ Diff}$

Radical Quantities by W. G. B.

19 Multiply $\sqrt[3]{18}$ into $5\sqrt[3]{4}$ $\frac{4\sqrt[3]{18}}{5\sqrt[3]{4}} = \frac{4\sqrt[3]{18} \cdot \sqrt[3]{9}}{5\sqrt[3]{4} \cdot \sqrt[3]{9}} = \frac{4\sqrt[3]{162}}{5\sqrt[3]{36}} = \frac{4 \cdot 3\sqrt[3]{2}}{5 \cdot 2\sqrt[3]{2}} = \frac{12\sqrt[3]{2}}{10\sqrt[3]{2}} = \frac{6\sqrt[3]{2}}{5}$

20 Multiply $4+2\sqrt{2}$ into $2-\sqrt{2}$ $\begin{array}{r} 4+2\sqrt{2} \\ 2-\sqrt{2} \\ \hline 8-4\sqrt{2}+4\sqrt{2}-2 \\ \hline 6-2\sqrt{2} \end{array}$ $(2\sqrt{4}-1)$

21 Multiply $a(a+\sqrt{c})^{\frac{1}{2}}$ into $b(a-\sqrt{c})^{\frac{1}{2}}$ $\begin{array}{r} a\sqrt{a+\sqrt{c}} \\ b\sqrt{a-\sqrt{c}} \\ \hline ab\sqrt{a^2-c} \end{array}$ $\text{Ans } ab\sqrt{a^2-c}$

22 Multiply $2(a+b)^{\frac{1}{n}}$ into $3(a+b)^{\frac{1}{m}}$ $\begin{array}{r} 2(a+b)^{\frac{1}{n}} \\ 3(a+b)^{\frac{1}{m}} \\ \hline 6(a+b)^{\frac{1}{n}+\frac{1}{m}} \end{array}$ Answer

23 Divide $6\sqrt[3]{54}$ by $3\sqrt[3]{2}$ $\frac{6\sqrt[3]{54}}{3\sqrt[3]{2}} = \frac{2\sqrt[3]{54}}{\sqrt[3]{2}} = \frac{2\sqrt[3]{54} \cdot \sqrt[3]{4}}{\sqrt[3]{2} \cdot \sqrt[3]{4}} = \frac{2\sqrt[3]{216}}{\sqrt[3]{8}} = \frac{2 \cdot 6}{2} = 6$ Ans

24 Divide $4\sqrt[3]{72}$ by $2\sqrt[3]{18}$ $\frac{4\sqrt[3]{72}}{2\sqrt[3]{18}} = \frac{2\sqrt[3]{72}}{\sqrt[3]{18}} = \frac{2\sqrt[3]{72} \cdot \sqrt[3]{4}}{\sqrt[3]{18} \cdot \sqrt[3]{4}} = \frac{2\sqrt[3]{288}}{\sqrt[3]{72}} = \frac{2 \cdot 6}{2} = 6$ Ans

25 Divide $2\sqrt[3]{27}$ by $\sqrt[3]{3}$ $\frac{2\sqrt[3]{27}}{\sqrt[3]{3}} = \frac{2\sqrt[3]{27} \cdot \sqrt[3]{4}}{\sqrt[3]{3} \cdot \sqrt[3]{4}} = \frac{2\sqrt[3]{108}}{\sqrt[3]{12}} = \frac{2 \cdot 6}{2} = 6$ Ans

26 Divide $8\sqrt[3]{512}$ by $4\sqrt[3]{2}$ $\frac{8\sqrt[3]{512}}{4\sqrt[3]{2}} = \frac{2\sqrt[3]{512}}{\sqrt[3]{2}} = \frac{2\sqrt[3]{512} \cdot \sqrt[3]{4}}{\sqrt[3]{2} \cdot \sqrt[3]{4}} = \frac{2\sqrt[3]{2048}}{\sqrt[3]{8}} = \frac{2 \cdot 16}{2} = 16$ Ans

27 Find the of $17\sqrt{21}$

28 Find the square of $5+\sqrt{2}$ $\begin{array}{r} 5+\sqrt{2} \\ 5+\sqrt{2} \\ \hline 25+10\sqrt{2}+2 \\ \hline 27+10\sqrt{2} \end{array}$ Ans

29 Find the 4th power of 16

$$\begin{array}{r} 676 \\ 676 \\ \hline 676 \\ 676 \end{array}$$

$$\begin{array}{r} 2\overline{)66} \quad \checkmark \quad 33 \\ \underline{66} \\ 0 \end{array}$$

$$\begin{array}{r} 2\overline{)6\sqrt{63}} \\ \underline{6\sqrt{6}} \\ 1296\sqrt{64} \end{array} \quad \frac{36}{36} = \frac{36}{36} = \frac{1}{36} \text{ Answer}$$

30th Find the cube of $ix - vt$

$$\begin{array}{r} \sqrt{x} - \sqrt{b} \\ \sqrt{x} - \sqrt{b} \\ \hline -\sqrt{bx} + b \\ x - \sqrt{bx} \\ \hline x - 2\sqrt{bx} + b \end{array}$$

$$x\sqrt{x} - \cancel{16x^{\frac{3}{2}}} - \cancel{6x^{\frac{3}{2}}} - \cancel{10x^{\frac{3}{2}}} - \cancel{10x^{\frac{3}{2}}} - x\sqrt{x} + 9\sqrt{x} - 6\sqrt{x} = \text{Ans}$$

314

Find a factor which will make \sqrt{y} rational.
 $\sqrt{y} \times \sqrt{y} = y$ Answer

3^d Find a factor which will make $\sqrt{5} - \sqrt{x}$ Rational
 $\sqrt{5} - \sqrt{x} \times \sqrt{5} + \sqrt{x}$ $\frac{\sqrt{5} - \sqrt{x}}{\sqrt{5} + \sqrt{x}}$

$$\begin{array}{r} 1 - \sqrt{x} \\ \sqrt{5} - \sqrt{x} \\ \hline \sqrt{5} - 1\sqrt{x} \\ \sqrt{5}x - x \\ \hline \text{Rational } 5 - \sqrt{5}x \\ \hline 5 - x \end{array} \quad \text{Answer}$$

33 Reduce $\frac{10}{x}$ to a fraction having a rational num.

$$\frac{V_a}{V_b} = \frac{V_a \times V_a}{V_b \times V_a} = \frac{a}{V_{ac}} \text{ Answer}$$

Q4 Reduce $\frac{\sqrt{6}}{\sqrt{4} \times \sqrt{3}}$ to a fraction having a rational denominator.

$$\frac{V_6}{V_{21}} = \frac{V_6 \times V_{21}}{V_{21} \times V_{21}} = \frac{V_{196}}{21} \text{ Ans.}$$

Equations Reduction of by $\frac{4}{5}$

Prob 1

Reduce $3 + 2\sqrt{x} - \frac{4}{5} = -6$ $15 + 10\sqrt{x} - \frac{4}{5} = -30$

$$10\sqrt{x} = -30 - 15 + 4$$

$$10\sqrt{x} = -41$$

$$100 \overline{) 100x} \quad \underline{171}$$

$$x = \frac{361}{100} \text{ Ans}$$

7. Reduce $4\sqrt{x} = 8$

$$4\sqrt{x} = 8$$

$$16 \overline{) 16x} = 64$$

$$16 \overline{) 16x} = 320 \text{ Ans}$$

8. Reduce $(2x+3)^{\frac{1}{2}} + 4 = 7$

$$\sqrt{2x+3} = 7-4$$

$$\sqrt{2x+3} = 3$$

$$2x+3 = 9$$

$$2 \overline{) 2x} = \underline{24} = x = 12 \text{ Ans}$$

9. Reduce $\sqrt{12+x} = 2 + \sqrt{x}$

$$12+x = 2 + \sqrt{x}$$

$$2 + \sqrt{x}$$

$$2\sqrt{x} + x$$

$$12+x = 4 + 4\sqrt{x} + x$$

$$4 + 4\sqrt{x} + x = 12 + x$$

$$4\sqrt{x} = 12 - 4$$

$$4\sqrt{x} = 8$$

$$16 \overline{) 16x} = 64$$

$$x = 4 \text{ Ans}$$

$$1x - 0 = 1x - a$$

$$\sqrt{x} - 0$$

$$1x - a$$

$$x - a$$

$$1x - \frac{1}{2}a$$

$$1x - \frac{1}{2}a$$

$$- \frac{1}{2}ax + \frac{1}{2}a$$

$$x - \frac{1}{2}a$$

$$1x - \frac{1}{2}a$$

$$1ax = a^2 + \frac{a^2}{2} + \frac{a^2}{16}$$

$$1ax = a^2 + \frac{a^2}{2} + \frac{a^2}{16}$$

$$1ax = 19a^2 + 16a^2 + 2a^2$$

$$1ax = 37a^2$$

$$x = \frac{37a^2}{a} = \frac{37a}{1} \text{ Ans}$$

Reduction of Equations by 11

Reduce $\sqrt{5} \times \sqrt{x+2} = 2 + \sqrt{5x}$

$$\frac{\sqrt{x+2}}{\sqrt{5}} \times \sqrt{5x+10} = \frac{2 + \sqrt{5x}}{1}$$

$$\sqrt{5x+10} = \frac{4 + 2\sqrt{5x}}{4 + 4\sqrt{5x} + 5x}$$

$$4 + 4\sqrt{5x} = 10$$

$$4\sqrt{5x} = 6$$

$$4\sqrt{5x}$$

$$16 \times 5x = 36$$

$$80 \mid 80x = 36$$

$$x = \frac{36}{80} = \frac{9}{20}$$

Ans

12 Reduce $\frac{x-ax}{1-x} = \frac{1-x}{x}$

$$\frac{x-ax}{1-x} = \frac{1-x}{x}$$

$$\frac{x(1-a)}{1-x} = \frac{1-x}{x}$$

13 Reduce $\frac{\sqrt{x+28}}{\sqrt{x+4}} = \frac{\sqrt{x+38}}{\sqrt{x+6}}$

$$\frac{\sqrt{x+28}}{\sqrt{x+4}} = \frac{\sqrt{x+38}}{\sqrt{x+6}}$$

$$\frac{1\sqrt{x+28}}{1\sqrt{x+4}} = \frac{1\sqrt{x+38}}{1\sqrt{x+6}}$$

$$\frac{6\sqrt{x+168}}{x+28\sqrt{x}} = \frac{4\sqrt{x+152}}{x+38\sqrt{x}}$$

$$x+34\sqrt{x}+168 = 42\sqrt{x}+152 = 34\sqrt{x}+168$$

$$42\sqrt{x}+152 = 34\sqrt{x}+168$$

$$42\sqrt{x}-34\sqrt{x} = 168-152$$

$$8\sqrt{x} = 16$$

$$64 \mid 64x = 256$$

$$x = 4$$

14 Reduce $1+x+1ax = 1a$

$$1+x+1ax = 1a$$

$$1ax+1 = a+x$$

$$1ax+1 = a+x$$

$$a \mid ax+1 = a+x$$

$$ax+1 = a+x$$

$$x+1 = a$$

$$x = a-1$$

Continued Dr. H. H.

15

Reduce $x \sqrt{a^2 + x^2} = \frac{9a^2}{10a^2 + 10x^2}$

$x \sqrt{a^2 + x^2} = 9a^2$

$x \sqrt{a^2 + x^2} = 9a^2 \cdot a^2 + x^2 = \frac{a^2}{x} \cdot \frac{x^2}{x}$

$x^2 \times a^2 + x^2$

$a^2 \sqrt{a^2 + x^2}$

$3 \sqrt{3} x^2 = a^2$

$1 \sqrt{x^2} = \frac{1}{3}$

$1 \sqrt{x^2} = \frac{1}{3}$

Answer

$x = a \sqrt{3}$ And

16 Reduce $x \sqrt{a^2 - x^2} = 10a^2 - x \sqrt{6^2 + x^2}$ And $6^2 \sqrt{a^2}$

$x \sqrt{a^2}$

$x \sqrt{a^2}$

$x \sqrt{a^2}$

$x \sqrt{a^2 + x^2} = a^2 + x \sqrt{6^2 + x^2}$

$x \sqrt{6^2 + x^2} = x^2 + 9ax$

$x^2 \times 6^2 + x^2$

$6^2 x^2 + x^2$

$\frac{x^2}{4ax^2 + 4a^2 x^2} = 6^2 x^2$

$\frac{1}{4ax} + \frac{1}{4a^2} = 6^2$

$\frac{4a}{4a} \frac{1}{4ax} = \frac{6^2 - 4a^2}{4a}$ And

17 Reduce $\sqrt{2+x} \sqrt{x} = \frac{4}{\sqrt{2+x}}$ And $x = 3$

$\sqrt{2+x}$

\sqrt{x}

$\sqrt{2+x} \sqrt{x} + 2 + x = 4$

$\sqrt{2+x} \sqrt{x} = 4 - 1 - x = 3 - x$

$2x + x^2 = 4 - 4x + x^2$

$2x + 4x = 4$

$6 \sqrt{6} \frac{x}{x} = \frac{4}{x} \cdot \frac{3}{3}$ And

18 Reduce $\sqrt{x-32} = 16 - \sqrt{x}$

$16 - \sqrt{x}$

$-16\sqrt{x} + x$

$x - 32 = 156 - 320\sqrt{x} + x$

$320\sqrt{x} = 256 + 32$

$320\sqrt{x}$

$64x$

288

1024

$1024x = 52444$

$x = 81$ And

$288 \sqrt{x}$

288

2504

1804

216

Reduction of Equations

19 Reduce $\sqrt{4x+17} = 2\sqrt{x+1}$

$$\begin{array}{r} 2\sqrt{x+1} \\ \sqrt{4x+17} \\ \hline 2\sqrt{x+1} \\ 4x+17 \\ \hline 4x+2\sqrt{x} \\ 4x+4\sqrt{x}+1 \end{array}$$

$$4\sqrt{x}+1=17$$

$$4\sqrt{x}=17-1=16$$

$$16 \overline{) 16x} = \frac{256}{16} \text{ Ans}$$

20 Reduce $\frac{\sqrt{6x-2}}{\sqrt{6x}+2} = \frac{4\sqrt{6x}-9}{4\sqrt{6x}+6}$

$$\begin{array}{r} 4\sqrt{6x}-9 \\ \sqrt{6x}+2 \\ \hline +8\sqrt{6x}-18 \\ 4x-9\sqrt{6x} \\ \hline 2x-\sqrt{6x}-18 \end{array}$$

$$\begin{array}{r} 4\sqrt{6x}+6 \\ \sqrt{6x}-2 \\ \hline -8\sqrt{6x}-12 \\ 4x+6\sqrt{6x} \\ \hline 2x-2\sqrt{6x}-12 \end{array}$$

$$- \sqrt{6x} + 2\sqrt{6x} = -12 + 18$$

$$\frac{-\sqrt{6x}}{\sqrt{6x}} = \frac{12}{6}$$

$$6 \overline{) 6x} = \frac{36}{6} \text{ Answer}$$

By Evolution Art. 299

Prob 6 What number is that the 4th part of whose square, being subtracted from 8 leaves a remainder equal to 4

Ans 4

$$\text{Then } 8 - \frac{x^2}{4} = 4$$

$$32 - x^2 = 16$$

$$-x^2 = 16 - 32$$

$$\frac{-x^2}{x^2} = \frac{-16}{16}$$

$$x = 4 \text{ Answer}$$

W. H. McCormick

Reduction of Equations by evolut

7 What two numbers are those whose sum is to the greater as 10 to 7 and whose sum multiplied into the less produces 270

$$(7x + 3x) \times 3x = 270$$

$$\begin{array}{r} 7x \\ 3x \text{ less} \end{array}$$

$$\begin{array}{r} 3x \\ 10x \\ 30x^2 = 270 \\ x^2 = 9 = x = 3 \text{ Ans} \end{array}$$

$$\begin{array}{l} 7x = 7 + 3 = 10 \text{ greater} \\ 3x = 3 \times 3 = 9 \text{ less} \end{array}$$

8 What two numbers are those whose difference is to the greater as 2 to 9 and the difference of whose squares is 128

Ans 18 and 14

$$\begin{array}{r} 9x \text{ the greater} \\ 2x \\ 7x \text{ less} \end{array}$$

$$\begin{array}{r} 9x \\ 7x \\ 49x^2 \end{array}$$

$$\begin{array}{r} 9x \\ 81x^2 \\ 49x^2 \\ 32x^2 = 128 \\ x^2 = 4 \\ x = 2 \end{array}$$

$$\begin{array}{l} 9x = 9 \times 2 = 18 \\ 7x = 7 \times 2 = 14 \text{ Ans} \end{array}$$

9 It is required to divide the number 18 into 2 such parts that the squares of those parts may be to each other as 25 to 16

Ans 10 and 8

$$\begin{array}{r} \text{Sup } x \text{ greater} \\ 18-x \text{ less} \end{array}$$

$$x^2 : (18-x)^2 :: 25 : 16$$

$$16x^2 = 25 \times (18-x)^2$$

$$4x = 5 \times (18-x)$$

$$4x = 90 - 5x$$

$$\begin{array}{r} 9x = 90 \text{ greater} \\ x = 10 \end{array}$$

10 It is required to divide the number 14 into two such parts that the quotient of the greater divided by the less may be to the quotient of the less divided by the greater as 16 to 9

Ans 8 and 6

$$\begin{array}{r} x \text{ greater} \\ 14-x \text{ less} \end{array}$$

$$\frac{x}{14-x} : \frac{14-x}{x} :: 16 : 9$$

$$\frac{9}{14-x} = \frac{224-16x}{x}$$

$$\begin{array}{r} 224 - 16x \\ 14 - x \\ -224x + 16x^2 \end{array}$$

$$9x^2 = 3136 - 224x$$

$$3x = 56 - 4x$$

$$3x + 4x = 56$$

$$\begin{array}{r} 7x = 56 \\ x = 8 \text{ greater} \end{array}$$

$$\begin{array}{r} 14 \\ 8 \\ 6 \text{ less} \end{array}$$

Equations By W. M. S. B.

11 What two numbers are as 5 to 4 the sum of whose cubes is 5103

Ans 15 and 12

$$\begin{array}{r} 5x \\ 3x \\ \hline 25x^3 \\ 27x^3 \\ \hline 52x^3 \end{array} \quad \begin{array}{r} 4x \\ 3x \\ \hline 16x^3 \\ 27x^3 \\ \hline 43x^3 \end{array} = 5103$$

$$189 \quad \frac{52x^3}{43x^3} = 5103$$

$$x^3 = 27 = x = 3$$

4 5
12 less 15 greater

12 Two travellers A and B set out to meet each other A leaving the town C at the same time that B left D They travelled the direct road between C and D and on meeting it appeared that A had travelled 18 miles more than B and that A could have gone B's distance in $15\frac{1}{4}$ days but B would have been 28 days in going A's distance Required the distance between C and D

Sup x the number of miles A traveled

the x-18 the number B traveled

$\frac{x-18}{15\frac{1}{4}}$ As day by day Then $x : x-18 :: \frac{x-18}{15\frac{1}{4}} : \frac{x}{28}$

$\frac{x}{28}$ B

$$\frac{x^2}{28} = \frac{x-18}{x-18}$$

$$\frac{x^2}{28} = \frac{x^2 - 18x}{x^2 - 36x + 324}$$

$$\frac{63x^2}{4} = 28x^2 - 1008x + 9072$$

$$163x^2 = 112x^2 - 4032x + 36288$$

$$9x^2 = 16x^2 - 576x + 5184$$

$$3x = 4x - 72$$

$$4x - 72 = 3x$$

$$4x - 3x = 72$$

$$\frac{4x}{x} = 72 \text{ As distance } \frac{72}{54} \text{ B } \frac{54}{126} \text{ Day}$$

Equations Continued 1844

13 Find two numbers which are to each other as 8 to 5 and whose product is 360 Ans 24 and 15

$$\begin{array}{l} 8x \times 5x = 360 \\ 40x^2 = 360 \\ x^2 = 9 \quad x = 3 \end{array} \quad \begin{array}{l} \frac{8}{24} \text{ and } \frac{5}{15} \text{ Ans} \end{array}$$

14 A gentleman bought two pieces of silk which together measured 36 yds each of them cost as many shillings by the yd. as there were yds in the piece and those whole prices were as 4 to 1 What were the lengths of the pieces x sup $36-x$ sup Ans 24 and 12 yds

$$\begin{array}{l} x^2 : 1296 : 36x \\ 1296 - 72x + x^2 : 4 : 1 \\ x^2 = 3184 - 288x + 4x^2 \\ x = 72 - 2x \\ 3x = 72 \text{ greater} \\ x = 24 \end{array} \quad \begin{array}{l} 24 \\ 12 \text{ less} \end{array}$$

15 Find two numbers which are to each other as 3 to 2 and the difference of whose fourth powers is to the sum of their cubes as 26 to 7 Ans 6 and 4

$$\begin{array}{l} 3x \\ 3x \\ 9x^2 \\ 27x^3 \\ 3x \\ 81x^4 \\ 16x^4 \text{ difference} \end{array} \quad \begin{array}{l} 2x \\ 2x \\ 4x^2 \\ 8x^3 \\ 2x \\ 16x^4 \\ 27x^3 \\ 8x^2 \\ 35x^2 \text{ sum out} \end{array} \quad \begin{array}{l} 65x^4 : 35x^3 : 26 : 7 \\ x^2 - 1455x^4 = 910x^3 \\ 455 \overline{) 1455x^4} = 910 \\ x = 2 \\ 3x = 6 \\ 2x = 4 \text{ Answer} \end{array}$$

16 Several gentlemen made an excursion each taking the same sum of money each had as many servants attending him as there were gentlemen the number of £ each had was double the number of all the servants and the whole sum of money taken out was 3456 £ How many men were there Ans 12

Sup x the men $\frac{x}{x^2}$
 $\frac{x^2}{x^3}$ the servants

The cube extracted $\frac{2}{2} \frac{(2x^2 = 3656}{x^3 = 1728} = x = 12$ Ans

17 A detachment of soldiers from a regiment being ordered to march on a particular service, each company furnishing four times as many as there were companies in the whole regiment - but these being found insufficient each company furnished three men more when their number was to be increased in the ratio of 14 to 16 How many companies were there in the regiment Ans 12

Sup x the number of companies

$x \times 4 = 4x$ in one company

$x \times 3 = 3x$ increase

$4x^2 + 3x :: \frac{x}{14} \text{ the whole} :: 17 : 16$

$x \mid 64x^2 + 48x = 68x^2$
 $64x + 48 = 68x$

$68x = 64x + 48$

$68x - 64x = 48$

$\frac{4x}{4} = 12$ Answer

Quadratic Equations

Reduce $3x^2 - 9x - 4 = 80$

Ans $x = 7$ or 4

$3x^2 - 9x = 84$
 $x^2 - 3x = 28$

$x^2 - 3x + \frac{9}{4} = 28 + \frac{9}{4} = \frac{121}{4}$

$x - \frac{3}{2} = \pm \sqrt{\frac{121}{4}} = \pm \frac{11}{2}$

$x = \frac{3}{2} \pm \frac{11}{2} = 7 \text{ or } 4$ Ans

2 Reduce $4x - \frac{36-x}{x} = 46$

Ans 12 or $-\frac{3}{4}$

$4 \mid 4x^2 - 36 - x = 46x$

$4x^2 - 45x = 36$
 $x^2 - \frac{45}{4}x = 9$

$x^2 - \frac{45}{4}x + \frac{2025}{64} = \frac{2025}{64} + 9 = \frac{2601}{64}$

$x - \frac{45}{8} = \pm \sqrt{\frac{2601}{64}} = \pm \frac{51}{8}$

$x = \frac{45}{8} \pm \frac{51}{8} = 12 \text{ or } -\frac{3}{4}$ Ans

Quadratic Equations by 11

3 Reduce $4x - \frac{14-x}{x+1} = 14$

$$4x^2 - 4x(14+x) = 14x + 14$$

$$4 \begin{array}{r} 14x^2 - 4x = 28 \\ \underline{x^2 - \frac{7x}{4} = 7} \end{array}$$

$$x^2 - \frac{7x}{4} + \frac{49}{16} = 7 + \frac{49}{16} = \frac{128}{16}$$

$$x^2 - \frac{7x}{4} = \frac{79}{16}$$

$$x - \frac{7}{4} = \frac{79}{16} \Rightarrow 16x - 28 = 79 \Rightarrow 16x = 107 \Rightarrow x = \frac{107}{16}$$

4 Reduce $5x - \frac{3x+2}{x-3} = 2x + 1$

$$10x^2 - 30x(2x+1) = 4x^2 - 12x + 2$$

$$10x^2 - 30x(2x+1) = 4x^2 - 12x + 2$$

$$x^2 - 3x + \frac{9}{4} = \frac{25}{4}$$

$$x - \frac{3}{2} = \frac{5}{2} \Rightarrow x = 4$$

$$x - \frac{3}{2} = \frac{5}{2} \Rightarrow x = 4$$

5 Reduce $16 - \frac{10x+9}{4x} = 3$

$$16x^2 - 10x - 9 = 12x^2$$

$$4x^2 - 10x - 9 = 0$$

$$x^2 - \frac{5x}{2} - \frac{9}{4} = 0$$

$$x^2 - \frac{5x}{2} + \frac{25}{16} = \frac{25}{16} + \frac{9}{4} = \frac{31}{4}$$

$$x - \frac{5}{4} = \frac{\sqrt{31}}{2} \Rightarrow x = \frac{5 + \sqrt{31}}{4}$$

$$x = \frac{5 + \sqrt{31}}{4}$$

6 Reduce $\frac{x^2}{x-4} + 1 = 10 - \frac{x}{2}$

$$x^2 + 2x(12x-20x-1x) = -88 + 16$$

$$x^2 - 18x + 81 = 81 - 72$$

$$x^2 - 18x + 81 = 81 - 72$$

$$x - 9 = -9 \Rightarrow x = 0$$

$$x = 9 \pm 3 = 12 \text{ or } 6$$

7 Reduce $\frac{x+4}{x-5} - \frac{4x+7}{x-5} = 1$

$$9x^2 - 4x(108+189+27x) = 1(x^2-15x+25)$$

$$9x^2 - 4x(108+189+27x) = 1(x^2-15x+25)$$

$$x^2 - 26x + 169 = 169 - 105$$

$$x - 13 = -10 \Rightarrow x = 3$$

$$x^2 - 26x + 169 = 169 - 105$$

$$x - 13 = -10 \Rightarrow x = 3$$

$$x = 13 \pm 10 = 23 \text{ or } 3$$

8 Reduce $\frac{x^2+1}{x^2-6x+9} = x-3$

$$x^2 - 10x^2 + 1 = x^2 - 9x - 9x^2 - 18x - 9$$

$$10x^2 + 9x - 9x^2 + 18x = -17$$

$$x^2 + 27x + 729 = 729 - 28$$

$$x + \frac{27}{2} = \frac{701}{2} \Rightarrow x = \frac{674}{2} = 337$$

$$x^2 + 27x + 729 = 729 - 28$$

$$x + \frac{27}{2} = \frac{701}{2} \Rightarrow x = \frac{674}{2} = 337$$

$$x = \frac{674}{2} = 337$$

9 24/9 6.1

$$24 \overline{) 96.1}$$

$$4 \overline{) 24} = 6$$

Algebraic Equations

9 Reduce $x^6 + x = 3$

$$6x + 2x + 2 = 3x^2 + 3x$$

$$3x^2 + 3x - 6x - 2x = 2$$

$$3/3x^2 - 3x = 2$$

$$x^2 - x = \frac{2}{3}$$

$$x - \frac{1}{2} = \sqrt{\frac{2}{3}} = \frac{\sqrt{6}}{3}$$

$$x = \frac{\sqrt{6}}{3} + \frac{1}{2} = 2 \text{ Ans}$$

11 Reduce $\frac{x}{a} + \frac{a}{x} = \frac{a}{x}$

$$\frac{ax^2 + a^2 - 2ax}{ax^2 - 2ax} = \frac{a^2}{a^2}$$

$$x^2 - 2x + 1 = 1$$

$$x - 1 = 0$$

$$x = 1 \text{ Ans}$$

14 Reduce $2x^3 + 3x^2 = 2$

$$2/2x^3 + 3x^2 = 2$$

$$x^3 + \frac{3}{2}x^2 = 1$$

$$x^3 + \frac{3}{2}x^2 + \frac{9}{16} = \frac{9}{16} + 1 = \frac{25}{16}$$

$$x + \frac{3}{4} = \sqrt{\frac{25}{16}} = \frac{5}{4}$$

$$x = \frac{5}{4} - \frac{3}{4} = \frac{1}{2}$$

$$x = \frac{1}{2}$$

$$= \frac{1}{2} \text{ Answer}$$

$$x = 7$$

$$= 7 \text{ Ans}$$

10 Reduce $\frac{3x}{x^2} - \frac{2}{x} = x - 2$

$$18x - x^2x + 2 = 6x^2 - 42x - 108$$

$$6x^2 - 42x - 18x + x^2 + x = -108 + 2$$

$$7x^2 - 59x = -110$$

$$x^2 - \frac{59}{7}x + \frac{110}{7} = \frac{110}{7} + \frac{110}{7} - \frac{6561}{196}$$

$$x - \frac{59}{14} = \sqrt{\frac{6561}{196}} = \frac{81}{14}$$

$$x = \frac{59}{14} + \frac{81}{14} = 10 \text{ Ans}$$

12 Reduce $x^4 + ax^2 = b$

$$x^4 + ax^2 - \frac{a^2}{4} = \frac{a^2}{4} + b$$

$$x^2 + \frac{a}{2} = \sqrt{\frac{a^2}{4} + b}$$

$$x = \left(-\frac{a}{2} \pm \sqrt{\frac{a^2}{4} + b} \right)^{\frac{1}{2}} \text{ Ans}$$

13 Reduce $\frac{x^6}{9} - \frac{x^3}{4} = -\frac{1}{4}$

$$128/128x^6 - 64x^3 = 8$$

$$x^6 - \frac{1}{2}x^3 = -\frac{1}{16}$$

$$x^6 - \frac{1}{2}x^3 + \frac{1}{16} = \frac{1}{16} - \frac{1}{16} = 0$$

$$x^3 - \frac{1}{4} = 0$$

$$x^3 = \frac{1}{4}$$

$$x = \sqrt[3]{\frac{1}{4}} \text{ Ans}$$

15

Reduce $\frac{1}{2}x - \frac{3}{5}x = 126$

$$\frac{x}{2} - \frac{3x}{5} = 126$$

$$5x - 6x = 126 \times 10$$

$$-x = 1260$$

$$x = -1260$$

$$x = -1260$$

$$x = -1260$$

$$x = -1260$$

$$x = -1260$$

Quadratic Equations

16 Reduce $2x^4 - x^2 + 96 = 99$

$$\frac{2x^4 - x^2 + 96}{2} = \frac{99 - 96}{2} \Rightarrow \frac{2x^4 - x^2}{2} = \frac{3}{2}$$

$$x^4 - \frac{x^2}{2} = \frac{3}{2}$$

$$x^4 - \frac{x^2}{2} + \frac{1}{16} = \frac{3}{2} + \frac{1}{16} = \frac{25}{16}$$

$$x^2 - \frac{1}{4} = \sqrt{\frac{25}{16}} = \frac{5}{4}$$

$$x^2 = \frac{5}{4} + \frac{1}{4} = \frac{6}{4}$$

$$x = \sqrt{\frac{6}{4}} = \frac{\sqrt{6}}{2} \text{ or } \pm \frac{\sqrt{6}}{2} \text{ Ans}$$

17 Reduce $(10+x)^2$

$$(10+x)^2 = 2$$

$$(10+x)^2 - (10+x)^2 + 4 = 2 + 4 = 6$$

$$(10+x)^2 = \sqrt{6} \Rightarrow \frac{1}{4} = \frac{3}{4}$$

$$(10+x)^2 = \frac{1}{2} + \frac{3}{2} = 2$$

$$(10+x)^2 = 4$$

$$10+x = 16 \Rightarrow x = 16-10$$

$$x = 6 \text{ Ans}$$

18 Reduce $3x^2 - 2x = -8$

$$\frac{3x^2 - 2x}{3} = \frac{-8}{3}$$

$$x^2 - \frac{2x}{3} = \frac{-8}{3}$$

$$x^2 - \frac{2x}{3} + \frac{4}{9} = \frac{-8}{3} + \frac{4}{9} = \frac{-24+4}{9} = \frac{-20}{9}$$

$$x^2 - \frac{2x}{3} = \frac{-20}{9}$$

19 Reduce

$$a^3 - a^2 = x - b$$

$$a^3 - a^2 - 3bx^2 + 3xb - b^2$$

$$b^3 - b^2 - 3bx^2 + 3xb - b^2$$

$$x^2 - 6x = a^3 - b^3$$

$$x^2 - 6x + 9 = \frac{a^3 - b^3}{36} + \frac{b^3}{4}$$

$$x - \frac{6}{2} = \sqrt{\frac{a^3 - b^3}{36} + \frac{b^3}{4}}$$

$$x = \frac{6}{2} \pm \sqrt{\frac{a^3 - b^3}{36} + \frac{b^3}{4}} \text{ Ans}$$

$$4 + \sqrt{36}$$

$$4 + \sqrt{36}$$

$$16 + 4\sqrt{36} - x$$

$$16 + 4\sqrt{36} - 36$$

$$\sqrt{16 + \frac{16}{6}} = 2$$

$$x = 2$$

$$x = 4 \text{ Ans}$$

20 Reduce

$$\frac{2(11x - x^2) - \sqrt{1+x-x^2}}{2} = -\frac{1}{2}$$

$$(11x - x^2) - \frac{1}{2}\sqrt{1+x-x^2} = -\frac{1}{2}$$

$$(11x - x^2) + \frac{1}{2}\sqrt{1+x-x^2} = \frac{1}{2}$$

$$\sqrt{1+x-x^2} = \frac{1}{2} - 2(11x - x^2)$$

$$2(11x - x^2) = \frac{1}{2} - \sqrt{1+x-x^2}$$

$$22x - 2x^2 = \frac{1}{2} - \sqrt{1+x-x^2}$$

$$x^2 - 11x = \frac{1}{4} - \frac{1}{2}\sqrt{1+x-x^2}$$

$$x^2 - 11x + \frac{121}{4} = \frac{1}{4} - \frac{1}{2}\sqrt{1+x-x^2} + \frac{121}{4}$$

$$x - \frac{11}{2} \pm \frac{1}{2}\sqrt{1+x-x^2} = \frac{1}{4}$$

$$x - \frac{11}{2} = \frac{1}{4} - \frac{1}{2}\sqrt{1+x-x^2}$$

$$\frac{4a^3 - 4b^3}{12b} + \frac{b^3}{12b} = \frac{4a^3 - 4b^3 + b^3}{12b}$$

21 Reduce

$$2\sqrt{x+9} = 16 - x$$

$$\sqrt{x+9} = \frac{16-x}{2}$$

$$3(3x + 2^2x) = 16$$

$$x + \frac{2^2x}{3} = \frac{16}{3}$$

$$x + \frac{4x}{3} = \frac{16}{3}$$

$$\frac{7x}{3} = \frac{16}{3} \Rightarrow x = \frac{16}{7}$$

Equation Continued

22 Reduce $x^5 + x^3 = 756$

$$x^5 + x^3 + \frac{1}{4} = 756 + \frac{1}{4} = 3024 \frac{1}{4}$$

$$x^5 + \frac{1}{4} = 3024 \frac{1}{4} \quad \frac{1}{4}$$

$$x^5 = -\frac{1}{4} + 3024 \frac{1}{4} = 27$$

$$x^5 = 27$$

$$x^5 = 3^3 \Rightarrow x = 3 \text{ Ans}$$

24 Reduce

$$215 - a + 31x = \frac{7a + 51}{6x - a}$$

$$215 - a + 31x = \frac{7a + 51}{6x - a}$$

$$215 - a$$

$$315 - 7a = 7a + 51 - 2x + 1a$$

$$8x - 402 = \frac{7a + 9x}{2a - 30}$$

$$81a + 34ax + 7x^2$$

$$9x^2 - 40ax = 81a^2$$

$$x^2 - 8ax = 9a^2$$

$$x^2 - 8ax + 64 = 64 + 9a^2 = 100a^2$$

$$x - 8a = 10a \Rightarrow x = 18a$$

$$x = 8 + 10a = 9a \text{ (Answer)}$$

26 Reduce $15x^5 + 11x^3 = 60x$

$$15x^5 + 11x^3 = 60x$$

$$15x^4 + 11x^2 = 60$$

$$x^4 + x^2 = 6$$

$$x^4 + x^2 + \frac{1}{4} = 6 + \frac{1}{4} = \frac{25}{4}$$

$$x^2 + \frac{1}{2} = \frac{5}{2} \Rightarrow x^2 = 2$$

$$x = \pm \sqrt{2} = 2 \text{ Ans}$$

23 Reduce $\sqrt{2x+1} + 2\sqrt{x} = \frac{21}{1728}$

$$2x + 1 + 2\sqrt{2x+1}\sqrt{x} = 21$$

$$2\sqrt{2x+1}\sqrt{x} = 21 - 1 - 2x = 20 - 2x$$

$$2\sqrt{2x+1}\sqrt{x} = 20 - 2x$$

$$4x\sqrt{2x+1}\sqrt{x} = 20\sqrt{x} - 2x\sqrt{x}$$

$$8x^2 + 4x + 80x - 4x^2 = 400$$

$$4x^2 - 84x = 400$$

$$x^2 + 21x = 100$$

$$x^2 + 21x + \frac{441}{4} = 100 + \frac{441}{4} = 84\frac{1}{4}$$

$$x + \frac{21}{2} = \sqrt{84\frac{1}{4}} = \frac{29}{2}$$

$$x = -\frac{21}{2} + \frac{29}{2} = 4 \text{ (Answer)}$$

$$x = -\frac{21}{2} + \frac{29}{2} = 4 \text{ (Answer)}$$

250 Reduce

$$x + 16 - 7\sqrt{x+16} = 10 - 4\sqrt{x+16}$$

$$10 - 4\sqrt{x+16} = x + 16 - 7\sqrt{x+16}$$

$$7\sqrt{x+16} = x + 6$$

$$30x + 16 = x + 6$$

$$29x = -10 \Rightarrow x = -\frac{10}{29}$$

$$9x + 144 = x^2 + 9x + 36$$

$$x^2 + 12x + 36 = 2x + 144 \text{ (Change)}$$

$$x^2 + 10x - 9x = 144 - 36$$

$$x + 9x = 108$$

$$x^2 + 3x + \frac{9}{4} = 108 + \frac{9}{4} = 44\frac{1}{4}$$

$$x + \frac{3}{2} = \sqrt{44\frac{1}{4}} = \frac{21}{2}$$

$$x = -\frac{3}{2} + \frac{21}{2} = 9 \text{ Ans}$$

Quadratic Equations

27 Reduce $\frac{4x-5}{x} - \frac{3x-7}{3x+7} = \frac{9x+23}{13x}$

$$\frac{156x^2+169x^2-455x-39x^2+91x^2}{156x^2+169x-455-39x^2+91x} = \frac{27x^2+132x+161}{27x^2+132x+161}$$

$$\frac{156x^2+169x-39x^2+91x-27x^2-132x}{-66x^2+260x-66x} = \frac{161+155}{161}$$

$$\frac{90x^2+260x-66x}{-132x} = 616$$

$$x + \frac{64x}{45} = \frac{808}{45}$$

$$x + \frac{64x}{45} + \frac{4096}{8100} = \frac{808}{45} + \frac{4096}{8100} = \frac{59536}{8100}$$

$$x + \frac{64}{90} = \sqrt{\frac{59536}{8100}} = \frac{244}{90}$$

$$x = \frac{64}{90} + \frac{244}{90} = 2 \text{ Ans}$$

28 Reduce

$$\frac{2}{6x-x} + \frac{6}{x^2+2x} = \frac{11}{5x}$$

$$\frac{x^2+30x+180x-30x}{15x+30+180-30x} = \frac{66x-11x^2+132x+22x^3}{66x-11x^2+132-22x}$$

$$15x-30x-66x+11x^2+22x = 132-180-30$$

$$\frac{66x}{-91x} = \frac{15x}{37x} = \frac{-30}{-78}$$

$$11x-59x = 7$$

$$x^2-59x = 78$$

$$x^2 - \frac{59x}{11} + \frac{3481}{484} = \frac{3481-78}{484} = \frac{14}{484}$$

$$x - \frac{59}{11} = \sqrt{\frac{14}{484}} = \frac{1}{11}$$

$$x = \frac{59}{11} + \frac{1}{11} = 5 \text{ Answer}$$

29 Reduce

$$(x-5)^2 - 3(x-5)^2 = 40$$

$$(x-5)^2 - 3(x-5)^2 + 9 - 40 + \frac{16}{4} = \frac{16}{4}$$

$$\sqrt{(x-5)^2 - \frac{3}{4}} = \sqrt{\frac{16}{4}} = \frac{13}{4}$$

$$\sqrt{(x-5)^2} = \frac{3}{2} + \frac{13}{4} = 8$$

$$(x-5)^2 = 8$$

$$(x-5)^2 = 64$$

$$x-5 = 4$$

$$x = 4+5 = 9 \text{ Ans}$$

30 Reduce

$$x + \sqrt{x+6} = 2 + 3\sqrt{x+6}$$

$$2 + 3\sqrt{x+6} = x + \sqrt{x+6}$$

$$3\sqrt{x+6} - \sqrt{x+6} = x - 2$$

$$2\sqrt{x+6} = x - 2$$

$$4x^2 + 6 = x^2 - 4x + 4$$

$$4x^2 + 6$$

$$4x^2 + 24$$

$$x^2 - 4x + 4 = 4x + 24$$

$$x^2 - 4x - 4x = 24 - 4 = 20$$

$$x^2 - 8x = 20$$

$$x^2 - 8x + 16 = 36$$

$$x - 4 = \sqrt{36} = 6$$

$$x = 4 + 6 = 10 \text{ Ans}$$

Problems Equations Contin

Pro 2/ The ages of two brothers are such that their sum is 45 years and their product 500 What is the age of each

$$\begin{aligned} 45 - x & \text{ youngest} \\ x & \text{ eldest} \\ 45x - x^2 &= 500 \\ x^2 - 45x &= -500 \\ x^2 - 45x + \frac{2025}{4} &= \frac{2025}{4} - 500 = \frac{225}{4} \\ x - \frac{45}{2} &= \sqrt{\frac{225}{4}} = \frac{15}{2} \\ x &= \frac{45}{2} \pm \frac{15}{2} = 25 \text{ and } 20 \text{ (Ans)} \end{aligned}$$

7 Two persons have pieces in a lottery the difference of which is 1008 and the greater is to the less as the less to 10 but are the prizes (Ans 2 and 1)

$$\begin{aligned} x+100 : x : x : 10 \\ 10x+1000 &= x^2 \\ x^2 - 10x &= -1000 \\ x^2 - 10x + 25 &= 1975 \\ x - 5 &= \sqrt{1975} = 35 \sqrt{190} \\ x &= 5 \pm 35 = 40 \text{ less } 160 \text{ and } 160 \text{ more} \end{aligned}$$

9 Divide the number 56 into two such parts that their product be 640

$$\begin{aligned} x \times 56 - x^2 &= 640 \\ x^2 - 56x &= -640 \\ x^2 - 56x + 784 &= 784 - 640 = 144 \\ x - 28 &= \sqrt{144} = 12 \\ x &= 28 \pm 12 = 40 \text{ or } 16 \text{ (Answer)} \end{aligned}$$

6 To find two numbers whose difference shall be 12 and the sum of their squares 1424

$$\begin{aligned} x^2 + (x+12)^2 &= 1424 \\ x^2 + 24x + 144 &= 1424 \\ x^2 + 24x &= 1280 \\ 2 \mid x^2 + 24x &= 1280 \\ x + 12 &= 640 \\ x^2 + 24x + 36 &= 640 + 36 = 676 \\ x + 6 &= \sqrt{676} = 26 \\ x &= -6 \pm 26 = 20 \text{ less } 32 \text{ and } 32 \text{ more} \end{aligned}$$

8 What two numbers are those whose sum is 6 and the sum of their cubes 72

$$\begin{aligned} x^3 + (6-x)^3 &= 72 \\ x^3 + 6^3 - 3 \cdot 6^2 x + 3 \cdot 6x^2 - x^3 &= 72 \\ 216 - 108x + 18x^2 - x^3 &= 72 \\ 18x^2 - 108x &= 72 - 216 = -144 \\ x^2 - 6x &= -8 \\ x^2 - 6x + 9 &= 9 - 8 = 1 \\ x - 3 &= \sqrt{1} \\ x &= 3 \pm 1 = 2 \text{ and } 4 \text{ (Ans)} \end{aligned}$$

Quadratic Equations

10 A gentleman bought a number of pieces of cloth for 675\$ which he sold again at 48\$ by the piece and gained by the bargain as much as one piece cost him. What was the number of pieces? Ans 15

Supr the number of pieces be $48x - 675 = 675$

675 each piece cost

48x what sold for $48x - 675 = 675$

$$x = \frac{675 + 675}{48} = \frac{1350}{48} = 28.125$$

$$x = \frac{675}{48} = 14.0625$$

$$x = 14.0625 + 14.0625 = 28.125$$

11 A and B started together for a place 150 miles distant. A hourly progress was 3 miles more than B's and he arrived at his journey's end 8 hours and 20 minutes before B. What was the hourly progress of each? Ans 9 and 6

Supr the progress of A be $150 - 150 = 0$

150 time B took to travel

$$450x + 1500 - 450x = 25x + 750$$

$$150 \text{ time B took to travel } 150x + 450 = 1350$$

$$150 \text{ time A took to travel } 150x = 54$$

$$150x = 54 \Rightarrow x = \frac{54}{150} = \frac{9}{25}$$

$$x = \frac{9}{25} = 0.36$$

$$x = 0.36 = 3.6$$

12 The difference of two numbers is 6 and if 11 be added to twice the square of the less it will be equal to the square of the greater. What are the numbers? Ans 11 and 5

Supr the less

x

$x + 6$

$x + 6$

$6x + 36$

$2x + 47$

$2x^2 - x^2 - 12x = 36 - 47$

$x^2 - 12x = -11$

$x^2 - 12x + 36 = 36 - 11 = 25$

$x - 6 = \sqrt{25} = 5$

$x = 6 + 5 = 11$

11

5

11

5

11

5

Equations Continued

Prob 13 A and B distributed 1200 \$ each among a certain number of persons A received 40 persons more than B and B gave each individual 58 more than A How many were received by A and B

Sup x the number B recd. $\frac{1200}{x} - \frac{1200}{x+40} = 58$ Ans 120 or 80

$$1200x + 48000 - 1200x = 58x^2 + 2000x$$

$$58x^2 + 2000x = 48000$$

$$x^2 + 40x = 9600$$

$$x^2 + 40x + 400 = 9600 + 400$$

$$x + 20 = \sqrt{10000} = 100 \quad A$$

$$x = 100 - 20 = 80 \quad B \quad 80 + 40 = 120$$

14 Find 2 numbers whose sum is 10 and the sum of their squares 58 x greater $\frac{10-x}{x}$ Ans 7 and 3

$$\frac{10-x}{x}$$

$$\frac{100 - 10x + x^2}{x^2}$$

$$\frac{100 - 20x + 2x^2}{x^2} = 58$$

$$2 \mid 2x^2 - 20x = 58 - 100 = -42$$

$$x^2 - 10x = -21$$

$$x^2 - 10x + 25 = -21 + 25 = 4$$

$$x - 5 = \sqrt{4} = 2$$

$$x = 5 \pm 2 = 7 \text{ greater } \frac{10}{3} \text{ less}$$

15 Several gentlemen made a purchase in company for 175 \$ two of them having withdrawn the bill was paid by the others each furnishing 10 \$ more than his own share if the bill had been paid by all the company what was the number in the company at first

$$\frac{175}{x} - \frac{175}{x-2} = 10$$

Sup x the number $\frac{175x}{x-2} - 175 = 10x - 20$

$$10 \mid 10x^2 - 20x - 175x + 175 = 0$$

$$x^2 - 2x - 17.5 = 0$$

$$x^2 - 2x + 1 = 18.5 + 1 = 19.5$$

$$x - 1 = \sqrt{19.5} \approx 4.4$$

$$x = 1 + 4.4 = 5.4 \approx 5 \text{ Answer}$$

Affected

Equations Continued

Prob 16 A merchant bought several yds of linen for 60s out of which he reserved 15 yds and sold the remainder for 54s gaining 10 per cents a yd how many yds did he buy and at what price

$$\begin{aligned}
 & \text{Sup. } x \text{ the yds} \\
 & 5400x - 6000x + 90000 = 10x^2 - 150x \\
 & 10x^2 - 150x - 5400x + 6000x = 90000 \\
 & 10x^2 - 5250x + 90000 = 0 \\
 & 10x^2 - 5250x + 90000 = 0 \\
 & x^2 - 525x + 9000 = 0 \\
 & x = \frac{525 \pm \sqrt{525^2 - 4 \cdot 9000}}{2 \cdot 1} \\
 & x = \frac{525 \pm \sqrt{275625 - 36000}}{2} \\
 & x = \frac{525 \pm \sqrt{239625}}{2} \\
 & x = \frac{525 \pm 489.5}{2} \\
 & x = 512.25 \text{ or } 17.75 \\
 & \text{yds } 512.25 \text{ at } 80 \text{ cts per yd} \\
 & \text{yds } 17.75 \text{ at } 80 \text{ cts per yd}
 \end{aligned}$$

Prob 17 A and B set out from two towns which were 247 m distant and travelled the direct route till they met. A went 9 miles a day and the number of days which they travelled before meeting was greater by 3 than the number of miles which B went in a day.

$$\begin{aligned}
 & \text{Sup. } x \text{ the days} \\
 & \text{Then } 9x + x = 247 \\
 & x^2 - 18x + 19 = 0 \\
 & x = \frac{18 \pm \sqrt{18^2 - 4 \cdot 19}}{2 \cdot 1} \\
 & x = \frac{18 \pm \sqrt{324 - 76}}{2} \\
 & x = \frac{18 \pm \sqrt{248}}{2} \\
 & x = \frac{18 \pm 15.75}{2} \\
 & x = 16.875 \text{ or } 1.125
 \end{aligned}$$

Prob 18 A gentleman bought two pieces of cloth. The first of which cost 11 shillings a yard more than the other. The second piece cost 18s but she gave 2 yds less than she had. How many yds were there in each piece and what was the price of a yd of each.

$$\begin{aligned}
 & \text{Sup. } x \text{ the yds of the first piece} \\
 & \text{Then } 18x = 20x - 20 \\
 & 20x - 18x = 20 \\
 & 2x = 20 \\
 & x = 10
 \end{aligned}$$

Arithmetical Equations

Sup. x the number of yards of fine

$x+2$ the number

18¹ fine per yd.

x

16 coarse per yd.

$x+2$

18 Bco/20 cost p

36

20 Bco/16 cost coarser

22

12

12

$$360 - 320 = 40$$

$$360x + 720 - 320x = 4x + 8x$$

$$4x^2 + 8x - 360x + 320x = -720$$

$$4x^2 - 352x = -720$$

$$x^2 - 88x = -180$$

$$x - 44 = \pm 196 - 14$$

$$x = 44 \pm 14 = 18 \text{ fine piece}$$

$$x + 2 = 18 + 2 = 20 \text{ coarser piece}$$

A merchant bought 84 galls of maderia wine and a certain quantity of sherry for the price he paid for as many shillings by the gallon as there were galls of maderia and for the latter 4 shillings less by the gallon he sold of the mixture at 10s by the gallon and lost 48 + 16s by his bargain. required the price of the maderia and the number of galls of sherry sold. 18¹ fine 36

Sup. x the number of galls of maderia

x price of the maderia per gal

$x+4$ price of sherry

84

10

48

16

48

16

48

16

48

16

48

16

48

16

48

16

48

16

48

16

48

16

48

16

48

16

$$x^2 - 84x - 16x = 576$$

$$108x - 16x - 2160 - 40x = 2304$$

$$108x + 28x - 16x - 40x = 2304 + 2160$$

$$82x = 4464$$

$$x = 54$$

$$x + 4 = 58$$

$$x^2 - 108x + 169 = 2932 + 169 = 3101$$

$$x - 54 = \pm 49$$

$$x = 54 \pm 49 = 56 \text{ galls of maderia}$$

$$= 58 = 18 \text{ cost of sherry}$$

Equations Continued

20 If the square of a certain number be taken from 40 and the square root of this difference be increased by 10 and the sum be multiplied by 4 and the product divided by the number itself the quotient will be 4. What is the number. Ans 6

Sup x the number

$$140 - x^2 + 20 = 11$$

$$140 - x^2 + 20 = 4x$$

$$160 - x^2 = 4x$$

$$x^2 + 4x - 160 = 0$$

$$x^2 + 4x = 160$$

$$x^2 + 4x + 4 = 160 + 4$$

$$(x+2)^2 = 164$$

$$x+2 = \sqrt{164}$$

$$x = \sqrt{164} - 2$$

Ans 6

21 A person being asked his age replied if you add the square root of it to 5 of it and subtract 10 the remainder will be nothing. What was his age. Ans 16 years

$$x + \sqrt{x} - 10 = 0$$

$$x + \sqrt{x} = 10$$

$$x^2 + 2\sqrt{x} = 100$$

$$x^2 + 2\sqrt{x} + 1 = 100 + 1 = 101$$

$$(x + \sqrt{x})^2 = 101$$

$$x + \sqrt{x} = \sqrt{101}$$

$$x = \sqrt{101} - \sqrt{x}$$

his age = 16 Ans

22 Several casks of wine were purchased for 1000 £. Some of which contained 9 gallons more than the others and the price by the gallon was 18 less than 1 of the smaller cask contained the same number of gallons as each and the price by the gallon was 1 and 1/2 more than 18 per gallon.

Amherst College

Sept 1st - 1885

Sept 2nd - 1885

Sept 3rd - 1885

Sept 4th - 1885

Sept 5th - 1885

Sept 6th - 1885

Sept 7th - 1885

Sept 8th - 1885

Sept 9th - 1885

Sept 10th - 1885

Sept 11th - 1885

Sept 12th - 1885

Sept 13th - 1885

Sept 14th - 1885

Sept 15th - 1885

Sept 16th - 1885

Sept 17th - 1885

Sept 18th - 1885

Sept 19th - 1885

Sept 20th - 1885

Sept 21st - 1885

Sept 22nd - 1885

Sept 23rd - 1885

Equalities in Algebra

6th. ... of which the ... as 3 to 2 and ...

9th. ...


Let the value of x be $11\frac{1}{2}$

$x + y = 11\frac{1}{2}$

$x - y = 2\frac{1}{2}$

$2x = 14$

$x = 7$



11th. ...

12th. ...

12th. What two numbers are there ... whose sum as 1 to 3 and whose ... as 3 to 5

Let the numbers be x and y

$x + y = 4$

$3x = 5y$

$x = \frac{5}{2}y$

$\frac{5}{2}y + y = 4$

$\frac{7}{2}y = 4$

$y = \frac{8}{7}$

$x = \frac{12}{7}$

Answer: $\frac{12}{7}$ and $\frac{8}{7}$

16th. ...

Let the numbers be x and y

$x = a$

$y = b$

$x + y = a + b$

$x - y = a - b$

$2x = 2a$

$x = a$

$y = b$

6 questions Continued

19 Three persons A B and C purchase a horse for 100 £ but neither is able to pay for the whole. The payment would require the whole of A's money together with $\frac{1}{2}$ of B's or the whole of B's with $\frac{1}{3}$ of C's or the whole of C's with $\frac{1}{4}$ of A's how much money had each

$$\begin{array}{l} x = A's \\ y = B's \\ z = C's \\ a = 100 \end{array}$$

$$x + \frac{1}{2}y = a$$

$$y + \frac{1}{3}z = a$$

$$z + \frac{1}{4}x = a$$

$$4z + x = 4a$$

$$3y + z = 3a$$

$$2x + y = 2a$$

$$x = 4a - 4z$$

$$x = 2a - y$$

$$2a - y = 4a - 4z$$

$$2a - y = 8a - 8z \quad \times 3$$

$$6a - 3y = 24a - 24z$$

$$6a - 3y = 24a - 24z$$

$$6a - 3y = 24a - 24z$$

$$24z = 24a - 6a$$

$$24z = 21a - 21 \times 100 = 2100$$

$$24z = 2100$$

$$z = 87 \frac{1}{2}$$

$$z = 84$$

$$4 \times 84 + x = 4a$$

$$336 + x = 4a = 400$$

$$x = 400 - 336$$

$$x = 64$$

$$2 \times 64 + y = 2a = 200$$

$$y = 200 - 128$$

$$y = 72$$

$$x = 64 \quad y = 72 \quad z = 84$$

Answer

20 The sum of the distance which 3 persons A B and C have travelled is 62 miles. A's distance is equal to 4 times C's added to twice B's and twice C's added to 3 times B's is equal to 17 times C's. What are the respective distances

$$x = A's$$

$$y = B's$$

$$z = C's$$

$$18 + 4z = 62 - y - z$$

$$3z = 62 - y - 18$$

$$3z = 44 - y$$

$$y = 44 - 3z$$

$$y = 16$$

$$3z = 12 - 3y \times 4$$

$$12z = 33 - 12y$$

$$48z = 132 - 48y$$

$$0 = 55 - 82z$$

$$62 - 62z = 55 - 82z$$

$$y = 9$$

$$x = (2 \times 9) + (4 \times 7)$$

$$x = 18 + 28$$

$$x = 46$$

$$x + y + z = 62$$

$$x = 62 - y - z$$

$$4x + 3y = 17z$$

$$x = 62 - y - z$$

$$x = 62 - y - z$$

$$x = 62 - y - z$$

$$17z - 3y = 2y + 4z$$

$$17z - 3y = 4y + 8z$$

$$9z - 7y = 62 - y - z$$

$$17z - 3y = 4y + 8z$$

$$9z - 7y = 62 - y - z$$

$$4z + y = 15 - y + 62$$

$$5z = 77 + 62$$

Q1 To find x y and z from the equation

$$\text{quad. } 2x + 3y + 4z = 62 = a.$$

$$\text{and } 3x + 4y + 5z = 47 = b$$

$$4x + 5y + 6z = 38 = c.$$

$$20x + 15y + 12z = 606 \quad (1)$$

$$20x = -400 + 144a + 2820$$

$$-900 \quad 2340$$

$$-2340 \quad 480$$

$$20/20x = 480$$

$$x = 24$$

any

$$12x + 8y + 16z = 214 \quad (2)$$

$$20x + 15y + 12z = 606 \quad (3)$$

$$30x + 21y + 18z = 1206 \quad (4)$$

$$12(12x = 214 - 8y - 16z)$$

$$x = 24 - 8y - 6z$$

$$20(20x = 606 - 15y - 12z)$$

$$x = 606 - 15y - 12z$$

$$30(30x = 1206 - 24y - 20z)$$

$$x = 1206 - 24y - 20z$$

$$1206 - 24y - 20z = 606 - 15y - 12z$$

$$2400 - 480y - 400z = 1800 - 450y - 240z$$

$$240 - 8y - 6z = 606 - 15y - 12z$$

$$480a - 160y + 120z = 7206 - 180y - 144z$$

$$180y - 160y + 144z - 120z = 7206 - 480a$$

$$-160y + 24z = 7206 - 480a$$

$$-480y + 480y - 400z + 360z = 1800 - 2400c$$

$$-400z + 360z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

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$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

$$-40z + 36z = 1800 - 2400c$$

Equation 116

22 Given $\begin{cases} xy = 600 \\ xz = 300 \\ yz = 200 \end{cases}$ to find x, y and z

$$\frac{15xz = 300}{x = \frac{300}{3}}$$

$$\frac{3xy = 600}{x = \frac{600}{3}}$$

$$\frac{600}{3} = \frac{300}{1}$$

$$600z = 300y$$

$$\frac{3yz = 200}{z = \frac{200}{3}}$$

$$\frac{300y = 600z}{y = \frac{600z}{300}}$$

$$y = 2z$$

$$0 = 2z - 2z$$

$$2z = 200$$

$$\frac{2z}{2} = \frac{200}{2}$$

$$z = 100$$

$$y = 2z = 2 \times 100 = 200$$

$$y = 2z = 2 \times 20 = 40$$

$$x = \frac{600}{y} = \frac{600}{20} = 30$$

$$x = 30$$

$$y = 20$$

$$z = 10 \text{ Ans}$$

24 Given $\begin{cases} w + 50 = x \\ x + 120 = y \\ y + 195 = 3w \end{cases}$ to find w, x and z

$$x = w + 50$$

$$x = y - 120$$

$$y = z + 120$$

$$z = 3w - 195$$

$$w + 50 = y - 120$$

$$3w - 195 = y + 120$$

$$6w - 390 = y + 120$$

$$w - 39 = y + 120 - 50 \times 6$$

$$6w - y = 20 + 290$$

$$6w - 195 = 720 - 300$$

$$-195 = -840 - 670$$

$$1717 = 1520$$

$$y = 10$$

$$w - 270 = 120 - 50$$

$$w = 270 - 120 + 50$$

$$w = 200$$

$$x = 100 + 50$$

$$x = 150$$

$$z = 3w - 195$$

$$z = 10$$

25 This is a 4 digit number consisting of two equal the left hand side is equal to 6 divided the right hand digit and if 12 is subtracted from the number its left hand side will be equal to the square of the left hand digit. What is the number?

$$\text{Let } x = \text{left hand digit, } y = \text{right hand digit}$$

$$x - 3y = 1 \text{ left hand digit}$$

$$y = \text{the two numbers}$$

$$10x - 3y = 1$$

$$10x - 3y = 1$$

Continued B. 4

26 If a certain number be divided by the product of its two digits the quotient will be 2 and if 27 be added to the number the digits will be inverted what is the number Ans 36

x - the right hand
 y - the left hand

$$x \times 10 = 10x + y = 2$$

$$10x + y + 27 = 10y + x$$

$$10x + y = 10y + x - 27$$

$$9x - 9y = -27$$

$$x - y = -3$$

$$10(x - 3) + y = 27(x - 3)$$

$$10x - 30 + y = 27x - 81$$

$$27x - 6y - 10x - 30 + y = 0$$

$$17x - 5y = 30$$

$$y = \frac{17x - 30}{5}$$

$$y = \frac{17 \times 3 - 30}{5} = \frac{21}{5} = 4.2$$

$$y = \frac{17 \times 4 - 30}{5} = \frac{38}{5} = 7.6$$

$$y = \frac{17 \times 5 - 30}{5} = \frac{55}{5} = 11$$

$$y = \frac{17 \times 6 - 30}{5} = \frac{72}{5} = 14.4$$

$$y = \frac{17 \times 7 - 30}{5} = \frac{89}{5} = 17.8$$

$$y = \frac{17 \times 8 - 30}{5} = \frac{106}{5} = 21.2$$

$$y = \frac{17 \times 9 - 30}{5} = \frac{123}{5} = 24.6$$

$$y = \frac{17 \times 10 - 30}{5} = \frac{140}{5} = 28$$

$$y = \frac{17 \times 11 - 30}{5} = \frac{157}{5} = 31.4$$

$$y = \frac{17 \times 12 - 30}{5} = \frac{174}{5} = 34.8$$

$$y = \frac{17 \times 13 - 30}{5} = \frac{191}{5} = 38.2$$

$$y = \frac{17 \times 14 - 30}{5} = \frac{208}{5} = 41.6$$

$$y = \frac{17 \times 15 - 30}{5} = \frac{225}{5} = 45$$

$$y = \frac{17 \times 16 - 30}{5} = \frac{242}{5} = 48.4$$

$$y = \frac{17 \times 17 - 30}{5} = \frac{259}{5} = 51.8$$

$$y = \frac{17 \times 18 - 30}{5} = \frac{276}{5} = 55.2$$

$$y = \frac{17 \times 19 - 30}{5} = \frac{293}{5} = 58.6$$

$$y = \frac{17 \times 20 - 30}{5} = \frac{310}{5} = 62$$

$$y = \frac{17 \times 21 - 30}{5} = \frac{327}{5} = 65.4$$

$$y = \frac{17 \times 22 - 30}{5} = \frac{344}{5} = 68.8$$

$$y = \frac{17 \times 23 - 30}{5} = \frac{361}{5} = 72.2$$

$$y = \frac{17 \times 24 - 30}{5} = \frac{378}{5} = 75.6$$

$$y = \frac{17 \times 25 - 30}{5} = \frac{395}{5} = 79$$

$$y = \frac{17 \times 26 - 30}{5} = \frac{412}{5} = 82.4$$

$$y = \frac{17 \times 27 - 30}{5} = \frac{429}{5} = 85.8$$

$$y = \frac{17 \times 28 - 30}{5} = \frac{446}{5} = 89.2$$

$$y = \frac{17 \times 29 - 30}{5} = \frac{463}{5} = 92.6$$

$$y = \frac{17 \times 30 - 30}{5} = \frac{480}{5} = 96$$

$$y = \frac{17 \times 31 - 30}{5} = \frac{497}{5} = 99.4$$

$$y = \frac{17 \times 32 - 30}{5} = \frac{514}{5} = 102.8$$

$$y = \frac{17 \times 33 - 30}{5} = \frac{531}{5} = 106.2$$

$$y = \frac{17 \times 34 - 30}{5} = \frac{548}{5} = 109.6$$

$$y = \frac{17 \times 35 - 30}{5} = \frac{565}{5} = 113$$

$$y = \frac{17 \times 36 - 30}{5} = \frac{582}{5} = 116.4$$

$$y = \frac{17 \times 37 - 30}{5} = \frac{599}{5} = 119.8$$

$$y = \frac{17 \times 38 - 30}{5} = \frac{616}{5} = 123.2$$

$$y = \frac{17 \times 39 - 30}{5} = \frac{633}{5} = 126.6$$

$$y = \frac{17 \times 40 - 30}{5} = \frac{650}{5} = 130$$

$$y = \frac{17 \times 41 - 30}{5} = \frac{667}{5} = 133.4$$

$$y = \frac{17 \times 42 - 30}{5} = \frac{684}{5} = 136.8$$

$$y = \frac{17 \times 43 - 30}{5} = \frac{701}{5} = 140.2$$

$$y = \frac{17 \times 44 - 30}{5} = \frac{718}{5} = 143.6$$

$$y = \frac{17 \times 45 - 30}{5} = \frac{735}{5} = 147$$

$$y = \frac{17 \times 46 - 30}{5} = \frac{752}{5} = 150.4$$

$$y = \frac{17 \times 47 - 30}{5} = \frac{769}{5} = 153.8$$

$$y = \frac{17 \times 48 - 30}{5} = \frac{786}{5} = 157.2$$

$$y = \frac{17 \times 49 - 30}{5} = \frac{803}{5} = 160.6$$

$$y = \frac{17 \times 50 - 30}{5} = \frac{820}{5} = 164$$

$$y = \frac{17 \times 51 - 30}{5} = \frac{837}{5} = 167.4$$

$$y = \frac{17 \times 52 - 30}{5} = \frac{854}{5} = 170.8$$

$$y = \frac{17 \times 53 - 30}{5} = \frac{871}{5} = 174.2$$

$$y = \frac{17 \times 54 - 30}{5} = \frac{888}{5} = 177.6$$

$$y = \frac{17 \times 55 - 30}{5} = \frac{905}{5} = 181$$

$$y = \frac{17 \times 56 - 30}{5} = \frac{922}{5} = 184.4$$

$$y = \frac{17 \times 57 - 30}{5} = \frac{939}{5} = 187.8$$

$$y = \frac{17 \times 58 - 30}{5} = \frac{956}{5} = 191.2$$

$$y = \frac{17 \times 59 - 30}{5} = \frac{973}{5} = 194.6$$

$$y = \frac{17 \times 60 - 30}{5} = \frac{990}{5} = 198$$

$$y = \frac{17 \times 61 - 30}{5} = \frac{1007}{5} = 201.4$$

$$y = \frac{17 \times 62 - 30}{5} = \frac{1024}{5} = 204.8$$

$$y = \frac{17 \times 63 - 30}{5} = \frac{1041}{5} = 208.2$$

$$y = \frac{17 \times 64 - 30}{5} = \frac{1058}{5} = 211.6$$

$$y = \frac{17 \times 65 - 30}{5} = \frac{1075}{5} = 215$$

$$y = \frac{17 \times 66 - 30}{5} = \frac{1092}{5} = 218.4$$

$$y = \frac{17 \times 67 - 30}{5} = \frac{1109}{5} = 221.8$$

$$y = \frac{17 \times 68 - 30}{5} = \frac{1126}{5} = 225.2$$

$$y = \frac{17 \times 69 - 30}{5} = \frac{1143}{5} = 228.6$$

$$y = \frac{17 \times 70 - 30}{5} = \frac{1160}{5} = 232$$

$$y = \frac{17 \times 71 - 30}{5} = \frac{1177}{5} = 235.4$$

$$y = \frac{17 \times 72 - 30}{5} = \frac{1194}{5} = 238.8$$

$$y = \frac{17 \times 73 - 30}{5} = \frac{1211}{5} = 242.2$$

$$y = \frac{17 \times 74 - 30}{5} = \frac{1228}{5} = 245.6$$

$$y = \frac{17 \times 75 - 30}{5} = \frac{1245}{5} = 249$$

$$y = \frac{17 \times 76 - 30}{5} = \frac{1262}{5} = 252.4$$

$$y = \frac{17 \times 77 - 30}{5} = \frac{1279}{5} = 255.8$$

$$y = \frac{17 \times 78 - 30}{5} = \frac{1296}{5} = 259.2$$

$$y = \frac{17 \times 79 - 30}{5} = \frac{1313}{5} = 262.6$$

$$y = \frac{17 \times 80 - 30}{5} = \frac{1330}{5} = 266$$

$$y = \frac{17 \times 81 - 30}{5} = \frac{1347}{5} = 269.4$$

$$y = \frac{17 \times 82 - 30}{5} = \frac{1364}{5} = 272.8$$

$$y = \frac{17 \times 83 - 30}{5} = \frac{1381}{5} = 276.2$$

$$y = \frac{17 \times 84 - 30}{5} = \frac{1398}{5} = 279.6$$

$$y = \frac{17 \times 85 - 30}{5} = \frac{1415}{5} = 283$$

$$y = \frac{17 \times 86 - 30}{5} = \frac{1432}{5} = 286.4$$

$$y = \frac{17 \times 87 - 30}{5} = \frac{1449}{5} = 289.8$$

$$y = \frac{17 \times 88 - 30}{5} = \frac{1466}{5} = 293.2$$

$$y = \frac{17 \times 89 - 30}{5} = \frac{1483}{5} = 296.6$$

$$y = \frac{17 \times 90 - 30}{5} = \frac{1500}{5} = 300$$

$$y = \frac{17 \times 91 - 30}{5} = \frac{1517}{5} = 303.4$$

$$y = \frac{17 \times 92 - 30}{5} = \frac{1534}{5} = 306.8$$

$$y = \frac{17 \times 93 - 30}{5} = \frac{1551}{5} = 310.2$$

$$y = \frac{17 \times 94 - 30}{5} = \frac{1568}{5} = 313.6$$

$$y = \frac{17 \times 95 - 30}{5} = \frac{1585}{5} = 317$$

$$y = \frac{17 \times 96 - 30}{5} = \frac{1602}{5} = 320.4$$

$$y = \frac{17 \times 97 - 30}{5} = \frac{1619}{5} = 323.8$$

$$y = \frac{17 \times 98 - 30}{5} = \frac{1636}{5} = 327.2$$

$$y = \frac{17 \times 99 - 30}{5} = \frac{1653}{5} = 330.6$$

$$y = \frac{17 \times 100 - 30}{5} = \frac{1670}{5} = 334$$

$$y = \frac{17 \times 101 - 30}{5} = \frac{1687}{5} = 337.4$$

$$y = \frac{17 \times 102 - 30}{5} = \frac{1704}{5} = 340.8$$

$$y = \frac{17 \times 103 - 30}{5} = \frac{1721}{5} = 344.2$$

$$y = \frac{17 \times 104 - 30}{5} = \frac{1738}{5} = 347.6$$

$$y = \frac{17 \times 105 - 30}{5} = \frac{1755}{5} = 351$$

$$y = \frac{17 \times 106 - 30}{5} = \frac{1772}{5} = 354.4$$

$$y = \frac{17 \times 107 - 30}{5} = \frac{1789}{5} = 357.8$$

$$y = \frac{17 \times 108 - 30}{5} = \frac{1806}{5} = 361.2$$

$$y = \frac{17 \times 109 - 30}{5} = \frac{1823}{5} = 364.6$$

$$y = \frac{17 \times 110 - 30}{5} = \frac{1840}{5} = 368$$

$$y = \frac{17 \times 111 - 30}{5} = \frac{1857}{5} = 371.4$$

$$y = \frac{17 \times 112 - 30}{5} = \frac{1874}{5} = 374.8$$

$$y = \frac{17 \times 113 - 30}{5} = \frac{1891}{5} = 378.2$$

$$y = \frac{17 \times 114 - 30}{5} = \frac{1908}{5} = 381.6$$

$$y = \frac{17 \times 115 - 30}{5} = \frac{1925}{5} = 385$$

$$y = \frac{17 \times 116 - 30}{5} = \frac{1942}{5} = 388.4$$

$$y = \frac{17 \times 117 - 30}{5} = \frac{1959}{5} = 391.8$$

$$y = \frac{17 \times 118 - 30}{5} = \frac{1976}{5} = 395.2$$

$$y = \frac{17 \times 119 - 30}{5} = \frac{1993}{5} = 398.6$$

$$y = \frac{17 \times 120 - 30}{5} = \frac{2010}{5} = 402$$

$$y = \frac{17 \times 121 - 30}{5} = \frac{2027}{5} = 405.4$$

$$y = \frac{17 \times 122 - 30}{5} = \frac{2044}{5} = 408.8$$

$$y = \frac{17 \times 123 - 30}{5} = \frac{2061}{5} = 412.2$$

$$y = \frac{17 \times 124 - 30}{5} = \frac{2078}{5} = 415.6$$

$$y = \frac{17 \times 125 - 30}{5} = \frac{2095}{5} = 419$$

$$y = \frac{17 \times 126 - 30}{5} = \frac{2112}{5} = 422.4$$

$$y = \frac{17 \times 127 - 30}{5} = \frac{2129}{5} = 425.8$$

$$y = \frac{17 \times 128 - 30}{5} = \frac{2146}{5} = 429.2$$

$$y = \frac{17 \times 129 - 30}{5} = \frac{2163}{5} = 432.6$$

$$y = \frac{17 \times 130 - 30}{5} = \frac{2180}{5} = 436$$

$$y = \frac{17 \times 131 - 30}{5} = \frac{2197}{5} = 439.4$$

$$y = \frac{17 \times 132 - 30}{5} = \frac{2214}{5} = 442.8$$

$$y = \frac{17 \times 133 - 30}{5} = \frac{2231}{5} = 446.2$$

$$y = \frac{17 \times 134 - 30}{5} = \frac{2248}{5} = 449.6$$

$$y = \frac{17 \times 135 - 30}{5} = \frac{2265}{5} = 453$$

$$y = \frac{17 \times 136 - 30}{5} = \frac{2282}{5} = 456.4$$

$$y = \frac{17 \times 137 - 30}{5} = \frac{2299}{5} = 459.8$$

$$y = \frac{17 \times 138 - 30}{5} = \frac{2316}{5} = 463.2$$

$$y = \frac{17 \times 139 - 30}{5} = \frac{2333}{5} = 466.6$$

$$y = \frac{17 \times 140 - 30}{5} = \frac{2350}{5} = 470$$

$$y = \frac{17 \times 141 - 30}{5} = \frac{2367}{5} = 473.4$$

$$y = \frac{17 \times 142 - 30}{5} = \frac{2384}{5} = 476.8$$

$$y = \frac{17 \times 143 - 30}{5} = \frac{2401}{5} = 480.2$$

$$y = \frac{17 \times 144 - 30}{5} = \frac{2418}{5} = 483.6$$

Equations B_4 78

29 / A gentleman has two horses and a saddle which is worth 10 guineas. If the saddle be put on the first horse the value of both will be twice that of the second horse but if the saddle be put on the second horse the value of both will be less than that of the first by 13 guineas what is the value of each horse.

Ans 36 and 53.

the 56 and 53.

$$\begin{array}{l} \text{Let } x = 1^{\text{st}} \text{ horse} \\ y = 4^{\text{th}} \text{ horse} \end{array} \quad \begin{array}{l} x + 10 = 2y \quad \Rightarrow \quad x = 2y - 10 \\ y + 10 = x - 13 \quad \Rightarrow \quad x = y + 10 + 13 \end{array}$$

$$x + 10 - 2y = x - 2y - 10$$

$$y+10 = x^2-13 = x - y+10+13$$

23 10 9 110 113

4-3 70110113

33 Deer and horse

60

30 Divide the number 90 into 4 such parts
that the first increased by 2 the second diminished
by 2 the third multiplied by 2 the fourth divided by
2 shall be equal. Ans 18, 22, 10, and 20

also 18, 22, 16, and 28

Sitz x. 1. 1
Sitz x. 2. 1
Sitz x. 3. 1

172 = 20

18

$$g = 18 + 2 + 2$$

—

11

50

90

46

1911

$$\begin{array}{r} x + 2 = 1 \\ x + 2 = 43 \\ 23 = 90 \times 2 + 3 \\ 43 = 90 \times 2 + 3 \\ \hline x = 90 \times 53 \\ x = 4754 \\ x = 452 \end{array}$$

$$-75 = 4-4$$

$$4 - 5 = 23 \times 2$$

4 = 3 - 1

29 102 43 1

55-43

3 = 70

3-10

1871

Find 3 such numbers that the first with the sum
of the second and third shall be 100 the second with
the sum of the third and first shall be 90
and the sum of the 3 numbers shall be 45

Sup $x = \frac{1}{2}$ $x + \frac{1}{2} = \frac{3}{2}$ $-120 = a$

$$x + \frac{3}{2} = 120 - a$$

$$3 + 2\frac{x}{5} = 10 = 6$$

$$x + y + z = 93 = 0$$

Equations Continued

$$\begin{array}{r} 2x + y + z = 2a \\ 11x + 6y + z = 240 \\ \underline{-10x - 5y} \\ z = 75 \end{array}$$

$$z = 75$$

$$x = 50$$

$$y = 65$$

(Ans)

$$2x + y + z = 2a$$

$$5y + z - x = 5b$$

$$x + y + z = 2c$$

$$z = 2a - 2x - y$$

$$z = 5b + x - 5y$$

$$z = 2c - x - y$$

$$2a - 2x - y = 5b + x - 5y$$

$$2a - 2x - y = 2c - x - y$$

$$2a - 5b = 3x - 4y$$

$$2a - 2c = x$$

$$240 - 350 = 150 - 4y$$

$$4y = 260$$

$$y = 65$$

Two equations

$$2x(120) - 2x(95) = 50$$

$$2a = 240$$

$$5b = 350$$

32 What two numbers are those whose difference, sum and product are as the numbers 2, 3 and 5

Let x one
 & other

$$x - y : x + y : 2 : 3$$

$$x : y : xy : 3 : 5$$

$$3x : 3y = 2x : 2y$$

$$5x + 3y = 3xy$$

$$5x - 3xy = 3y$$

$$3x - 2x = 3y = x - 3y$$

$$5y - 15y = -5y$$

$$25 - 15y = -5$$

$$15 - 15y = -90$$

$$y = 2$$

$$x = 10$$

33 A vintner sold at one time 20 dozen of port wine and 30 doz of sherry and for the whole received 120 guineas at another time he sold 30 dozen of port & and 25 dozen of sherry at the same prices as before and for the whole received 140 guineas what was the price of a dozen of each sort of wine

Let x = price of port per doz

y = do sherry

$$20x + 30y = 120 \times 3$$

$$30x + 25y = 140 \times 3$$

$$60x + 90y = 360$$

$$60x + 50y = 280$$

$$40y = 80$$

$$y = 2$$

$$x = 5$$

34 A merchant having mixed a certain number of gallons of brandy and water found that if he had mixed 6 galls of each he would have put into the mixture 7 galls of brandy for every 6 of water but if he had mixed 6 galls of each he would have put in 6 gallons of brandy for every 5 of water how many galls of each did he mix

Ans 78 brandy 66 water

Equations By R. R.

Let $x = \text{brandy}$ $x + 6 : y + 6 :: 7 : 6$
 $y = \text{water}$ $x - 6 : y - 6 :: 6 : 5$

g-waher $\underline{x-6 : y-6 :: 6 : 5}$

$$x - y = 396 - 56$$

$$Sx = 36 + 20 - 36$$

$$\begin{array}{r} 30 \\ 426 \\ 136 \end{array}$$

$$5 \overline{) 990} \begin{array}{r} 198 \\ 990 \\ \hline 0 \end{array}$$

$\frac{5x=396}{x=78}$ Brandy

$$(x+26) = 73 + 49 \times 5$$

$$8x-56=64-56 \times 6$$

$$30x + 180 = 953 + 210$$

$$90x + 180 = 36x - 216$$

$$+360 = y - 426 = y = 426 - 360$$

3 = 66 water

3 = 66 water

35 What fraction is that whose numerator being doubled and the denominator increased by 4 the value becomes $\frac{2}{3}$ but the denominator being doubled and the num.^r increased by 2 the value becomes $\frac{3}{5}$

Let X -numerator
 Y = denominator

$\beta = \text{denom}$

$$\frac{2x}{5+7} = \frac{2}{5} \Rightarrow 6x = 23 + 14$$

$$\frac{x+2}{2y} = \frac{3}{5} \implies 5x = 6y - 14$$

$$63 = 38 + 10$$

$$6 \overline{) 108} = 18$$

$3 = 5$ den

$$2y = 6x - 14 \quad \times 3$$

$$y = 5x + 10$$

$$64 = 182 - 419$$

0-132-50

$$713/13x = 52$$

$$x = 4 \text{ min.}$$

36 A person expended 30 cts in apples and pears giving $\frac{1}{2}$ cent for 4 apples and $\frac{1}{3}$ cent for 5 pears he afterward parts with $\frac{1}{2}$ of his apples and $\frac{1}{3}$ of his pears the cost of which was 13 cents how many did he buy of each $\frac{1}{2}$ of 30 cts = 15 cts $\frac{1}{3}$ of 30 cts = 10 cts $\frac{1}{2}$ of 4 apples = 2 apples and $\frac{1}{3}$ of 5 pears = 1 $\frac{2}{3}$ pears

Let $x = \text{apples}$
 $y = \text{pears}$

$z = \text{pears}$

$$\text{Of } 4 : 1 \text{ am } x = \frac{x}{4}$$

$$5:1:3 = \frac{4}{5}$$

$$\frac{x}{4} + \frac{y}{5} = 30$$

$$4 : 1 : \frac{x}{2} = \frac{x}{83}$$

$$S' : 1 : \frac{2}{9} = \frac{83}{15}$$

$$\frac{2}{8} + \frac{7}{15} = 15$$

$$15x + 8y = 1560$$

$$\frac{x}{4} + \frac{y}{5} = 30$$

$$5x + 43 = 60 \times 3$$

$$15x + 12y = 1800$$

$$15x + 84 = 1560$$

$$4.743 = 240$$

g = 62

$$15x + 8 \times 60 = 1860$$

$$15x = 1560 - 480$$

$$15x = 1080$$

$$15x = 1080$$

$$x = 72 \text{ Apples}$$

Ratio By H. H. H.

1 Which is the greatest the ratio of 11:9 or that of 44:35

$$\frac{11}{9} = \frac{385}{315}$$

Ans 44:35 greatest

2 Which is the greatest the ratio of $a+3:5a$ or that of $2a+7:5a$

$$\frac{a+3}{1} \times \frac{5}{a} = \frac{5a+15}{a}$$

$$\frac{2a+7}{1} \times \frac{5}{a} = \frac{10a+35}{a}$$

$2a+7:5a$ the greatest

3 If the antecedent of a couplet be 65 and the ratio 13 what is the consequent

$$\frac{65}{13} = 5$$

$$65:5=13$$

4 If the consequent of a couplet be 7 and the ratio 18 what is the antecedent

$$18 \times 7 = 126$$

$$126:7=18$$

5 What is the ratio compounded of the ratios of 3:7 and 2a:5b and 1x11:3y

$$\frac{3}{2a} \times \frac{2a}{5b} = \frac{3}{5b}$$

$$\frac{11x}{3y} \times \frac{3}{5b} = \frac{11x}{5by}$$

$$42 \frac{11x}{5by} = \frac{462x}{5by}$$

6 What is the ratio compounded of $x+y:b$ and $x:y:a+b$ and $a+b:h$

$$\frac{x+y}{b} \times \frac{a+b}{x+y} = \frac{a+b}{b}$$

$$\frac{a+b}{b} \times \frac{a+b}{h} = \frac{(a+b)^2}{bh}$$

$$\frac{x^2 - y^2}{x^2 - y^2} = \frac{a^2 - b^2}{a^2 - b^2}$$

$$\frac{a^2 - b^2}{a^2 - b^2} = \frac{a^2 - b^2}{a^2 - b^2}$$

$$\frac{a+b}{a+b} = \frac{h}{h}$$

$$a+b \frac{(a^2 - b^2 + a^2 - b^2)}{x^2 - y^2} = \frac{a^2 - b^2}{x^2 - y^2}$$

$$x^2 - y^2 : bh$$

7 If the ratio of $5x+4:2x-3$ and $x+2:5x+3$ be compounded will they produce a ratio of greater inequality or less inequality

Ans a ratio of greater inequality

Ratio Continued.

$$\frac{5x+7}{x+2} : \frac{2x-3}{x+6} \quad \frac{1}{2}x+3 = \frac{x+6}{2}$$

$$\frac{10x+14}{x} : \frac{19x-18}{x+6}$$

$$5x^2 + 17x + 14 : 2x^2 + 9x - 18$$

$$\frac{10x^2 + 34x + 28}{2x^2 + 9x - 18} \text{ A ratio of greater inequality}$$

8 What is the ratio compounded of $x+y:a$ and $x-y:b$ and $b:\frac{x^2-y^2}{a}$ Ans

$$\begin{array}{l} x+y:a \\ x-y:b \\ \hline x^2-y^2:ab \\ \hline x^2-y^2:\frac{x^2-y^2}{a} \end{array}$$

$$\begin{array}{l} b:\frac{x^2-y^2}{a} \\ \hline ab:x^2-y^2 \end{array}$$

$abx^2 : aby^2 : abx^2 : aby^2$ is ratio of equality

9 What is the ratio compounded of $4:5$ and the duplicate ratio of $6:9$ and the triplicate ratio of $3:2$

$$\begin{array}{r} 4:5 \\ 16:81 \\ \hline 112:405 \\ 27:8 \\ \hline 484:3240 \\ 216:13024:2940 \\ \hline 14:15 \end{array}$$

10 What is the ratio compounded of $3:4$ and the triplicate ratio of $x:y$ and the subduplicate ratio of $49:9$ Ans $x^3:y^3$

$$\begin{array}{r} 3:4 \\ x^3:y^3 \\ \hline 3x^3:4y^3 \\ 7:5 \\ \hline 21:21x^3:21y^3 \\ \hline 1^3:9^3 \text{ Ans} \end{array}$$

Of proportions

What are two numbers whose product is 135 and the difference of their squares is to the square of their difference as 11 to 1 What are the numbers Ans 15 and 9

Suppose x - one
 y - other

$$xy = 135$$

$$x^2 - y^2 : (x - y)^2 :: 11 : 1$$

$$\frac{x^2 - y^2}{x - y} : \frac{(x - y)^2}{x - y} :: 11 : 1$$

$$x + y : x - y :: 11 : 1$$

$$2x : x - y :: 11 : 1$$

$$5x - 5y = 2x$$

$$3x = 5y$$

$$x = \frac{5y}{3}$$

$$x - y = 2x$$

$$5y - 8y = -3y$$

$$y = 9$$

$$\begin{array}{r} 5x = 5y \\ 213x = 45 \\ x = 15 \end{array}$$

What two numbers are those whose sum and product are as the numbers 2, 3 and 5 respectively

Suppose x - one
 y - other

$$x + y : xy :: 2 : 3$$

$$x + y : xy :: 3 : 5$$

$$x + y : x + y :: 2 : 3$$

$$2x : x + y :: 5 : 3 = \frac{6x = 5x + 5y}{-5x}$$

$$5x + 5y = 3xy$$

$$y(25y + 5y) = 15y^2$$

$$25 + 5 = 15y$$

$$15y = 30$$

$$y = 2$$

$$x = 5y = x = 2x = 10$$

$$\begin{array}{r} y = 2 \\ x = 10 \end{array}$$

12 Divide the number 24 into two such parts that their product shall be to the sum of their squares as 3 to 10 Ans 18 and 6

Proportion

Let x = greater
 $24 - x$ = less

$$24x - x^2 : (24 - x)^2 + x^2 :: 3 : 10$$

$$24x - x^2 : \frac{576 - 48x + x^2 + x^2}{24x - x^2} :: 3 : 10$$

$$24x - x^2 : 576 - 48x + 2x^2 :: 3 : 10$$

$$24x - x^2 : 576 :: 3 : 16$$

$$384x - 16x^2 = 1728$$

$$16(16x^2 - 384x) = -1728$$

$$x^2 - 24x = -108$$

$$x^2 - 24x + 144 = 144 - 108$$

$$x - 12 = \sqrt{\frac{36}{1}} = 6$$

$$x = 12 + 6 = 18 \text{ greater}$$

$\frac{24}{18}$ less

13 In a mixture of rum and brandy the difference between the quantities of each is to the quantity of brandy as 100 is to the number of gallons of rum and the same difference is to the quantity of rum as 4 to the number of galls of brandy. How many galls of brandy each.

Let x = rum
 y = brandy

Then 25 rum & brandy

$$\frac{x - y}{y} : y :: 100 : x$$

$$\frac{x - y}{x} : x :: 4 : y$$

$$\frac{x - y}{y} = \frac{100}{x}$$

$$\frac{x - y}{x} = \frac{4}{y}$$

$$x^2 - xy = 100y$$

$$xy - y^2 = 4x$$

$$x^2 - 104y + 100y = 4x$$

$$x^2 - 4x - 4y = 0$$

$$695y^2 - 5000y - 10000 = 0$$

$$695y^2 - 5000y = 10000$$

$$y^2 - 7.2y = 14.4$$

$$y^2 - 7.2y + 12.96 = 14.4 + 12.96$$

$$y^2 - 7.2y + 12.96 = 27.36$$

$$y - 3.6 = \sqrt{\frac{27.36}{1}} = 5.2$$

$$y = 3.6 + 5.2 = 8.8 \text{ Brandy}$$

$$x = 25y - 100 = 25(8.8) - 100 = 220 - 100 = 120 \text{ Rum}$$

Continued

14 There are two numbers which are to each other as 3 to 2 if 6 be added to the greater and subtracted from the less the sum and remainder will be to each other as 3 to 1 what are the numbers

Let x = one
 y = other

$$x : y :: 3 : 2$$

$$x + 6 : y - 6 :: 3 : 1$$

$$x + y : y - 6 :: 4 : 1$$

$$x + y : y :: 5 : 2$$

$$x + y = 4y - 24$$

$$x = 3y - 24$$

$$2x = 3y$$

First Equation

$$3y - 24 \times 2 = 3y$$

$$2x = 3y - 3 \times 16$$

$$6y - 48 = 3y$$

$$2 \times 2x = 48$$

$$3y - 3y = 48$$

$$x = 24 \text{ Greater}$$

$$3 \times 24 = 72 \text{ Less}$$

Ans
 $x = 24$
 $y = 16$

15 There are two numbers whose product is 320 and the difference of their cubes is to the cube of their difference as 61 to 1 What are the numbers

Let x = one
 y = other

$$xy = 320$$

$$x^3 - y^3 : (x - y)^3 :: 61 : 1$$

Ans 20 and 16

$$\frac{x^3 - y^3}{x^2 - 2xy + y^2} = \frac{x^3 - y^3}{x - y}$$

$$x^3 - y^3 : x^2 - 2xy + y^2 :: 61 : 1$$

$$x^3 - y^3 : (x - y)^3 :: 61 : 1$$

$$3xy : (x - y)^2 :: 60 : 1$$

$$3xy = 960$$

$$960 : x^2 - 2xy + y^2 :: 60 : 1$$

$$60(60x - 120xy + 60y^2) = 960$$

$$x^2 - 2xy + y^2 = 16$$

$$y^2 - 2xy + x^2 = 16 - x^2 + x^2 = 16$$

$$y - x = 4$$

$$y = 4 + x$$

$$x = 20$$

$$y = 16 \text{ Ans}$$

$$xy = 320$$

$$x + 4x = 320$$

$$x^2 + 4x + 16 = 320$$

$$x + 2 = \sqrt{324} = 18$$

$$x = 18 - 2 = 16$$

$$x = 16$$

16 There are two numbers which are to each other in the duplicate ratio of 16 to 9 and 24 is a mean proportional between them - what are the numbers Ans 32 and 18

Let x - one
 y - the other

$$\sqrt{xy} = 24 \quad \text{substituting value of } x \text{ in } y$$

$$\frac{16x}{9} = 576 \quad \text{first column}$$

$$16x = 5184$$

$$x = \frac{5184}{16} = 324$$

$$y = \frac{24^2}{x} = \frac{576}{324} = 18$$

Ans $x = 324$
 $y = 18$

Progression B, 11m

1. The first term of an arithmetical progression is 7 the common difference 3 and the number of terms 9 what is the last term

$$l = a + (n-1)d = 7 + (9-1)3 = 31 \quad \text{Ans 31}$$

2. If the last term of an increasing progression is 66 the number of terms 19 and the common difference 5 what is the first term Ans 8

$$a + (n-1)d = 66 \quad (19-1)5$$

$$a + 80 = 66$$

$$a = 66 - 80 = -14$$

Ans $a = -14$

3. Find 6 arithmetical means between 1 and 113

$$d = \frac{113 - 1}{6+1} = \frac{112}{7} = 16 \quad \text{Common difference 16}$$

$$R = \frac{25 - 20n}{n - 1} = \frac{25 - 20n}{n - 1} = \frac{25 - 20n}{n - 1}$$

$$dn^2 - 1n + 20n = 25$$

$$dn^2 + (20 - 1)n = 25$$

$$d \{ dn + (20 - 1)n \} = 25$$

$$\frac{n^2 + 20n - 1n}{d} = \frac{25}{d}$$

$$\frac{n^2 + 19n - 1n}{d} = \frac{25}{d}$$

$$n^2 + 18n - 1n = 25$$

Progression

Arithmetical

Q1 If the first term of an increasing progress is 3 the common difference 2 and the number of terms 20 what is the sum of the series Ans 440

$$3 = a + (n-1)d = 3 + (20-1)2 = 41$$

$$S = a + \frac{1}{2} \times n = 3 + \frac{1}{2} \times 20 = 440 \text{ Ans}$$

Q2 If 100 stones be placed in a straight line at the distance of a yd from each other how far must a person travel to bring them one by one to a box placed at the distance of a yd from the first stone Ans 5 miles 1300 yds

$$S = \frac{a + (n-1)d}{2} \times n = \frac{2 + (100-1)2}{2} \times 100 = 10100$$

10100 Sm
1300 yds

Q3 What is the sum of 150 terms of the series

3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99 101 103 105 107 109 111 113 115 117 119 121 123 125 127 129 131 133 135 137 139 141 143 145 147 149 151

$$151 = 0.56$$

$$6 \times 150 = 900$$

$$151 \times 150 = 22650$$

$$22650 + 900 = 23550$$

$$23550 \div 2 = 11775 \text{ Ans}$$

$$3 = a + (n-1)d$$

$$3 = 3 + (150-1)2 = 3$$

$$S = \frac{3 + 150}{2} \times 150 = 11775 \text{ Ans}$$

Q4 If the sum of an 14 S's the last term 8 and the number of terms 30 what is the common difference

$$d = \frac{2S - 2an}{n^2 - n}$$

Ans 3

$$d = \frac{2 \times 10 - 200}{30^2 - 30} = \frac{2010}{870} = 3 \text{ Common Difference}$$

Q5 If the sum of an arithmet series is 567 the first term 7 and the common difference 2 what is the number of terms

Ans 21

$$n = \frac{(2a - d) + 8ds - 2a + d}{4}$$

$$n = \frac{(14 - 2) + 9072}{4} = 14 + 2$$

$$\begin{array}{r} 12 \\ 144 \\ 9072 \\ 9216 \\ 186 \\ 1116 \\ 1116 \end{array}$$

$$\begin{array}{r} 96 \\ -12 \\ \hline 84 \\ \hline 4 \end{array} \Rightarrow 21 \text{ number of terms}$$

Arithmetical

6 What is the sum of 32 terms of the Series
1 1 2 2 2 3 &c

$$S = a + (n-1)d$$

$$S = 1 + (32-1) \frac{1}{2} = 31 + 1 = 32$$

$$1 + 32 = \frac{2+33}{4} \times 32 = \frac{1120}{4} = 280 \text{ Ans}$$

7. A gentleman bought 47 books and gave 10 cts for the first 30 for the second 50 for the third &c what did he pay for the whole

$$S = a + (n-1)d$$

$$S = 10 + (47-1)20 = 930$$

$$S = \frac{a_1 + a_n}{2} \times n = \frac{10 + 930}{2} \times 47$$

$$\frac{940}{2} = 470$$

$$\begin{array}{r} 470 \\ 47 \\ \hline 22190 \text{ Ans} \end{array}$$

8. A person put into a charity box a cent the first day of the year two cents the second day 3 cts the third day &c to the end of the year what was the whole sum for 365 days

$$S = a + (n-1)d$$

$$S = 1 + (365-1)1 = 365$$

$$1 + 365 = 366$$

$$\frac{366}{2} = 183$$

$$\frac{365}{2} = 182 \frac{1}{2}$$

$$\begin{array}{r} 182 \frac{1}{2} \\ 183 \\ \hline 365 \frac{1}{2} \text{ Ans} \end{array}$$

Ar. 433 Prob 2 The sum of three numbers in arithmetical progression is 9 and the sum of their cubes is 153 what are the numbers

Sup 1 = second 3 = common difference

$$(x-y) + x + (x+y) = 9$$

$$3x = 9$$

$$x = 3 \text{ second number}$$

$$x-y$$

$$x$$

$$x+y$$

$$x-y$$

$$x$$

$$x+y$$

$$x-y$$

$$x$$

$$x+y$$

$$\frac{x}{x^3}$$

$$\frac{x+y}{x^3 + 3xy^2 + y^3}$$

$$\frac{x}{x^3}$$

$$\frac{x+y}{x^3 + 3xy^2 + y^3}$$

$$\frac{x}{x^3}$$

$$\frac{x+y}{x^3 + 3xy^2 + y^3}$$

$$\frac{x}{x^3}$$

$$\frac{x+y}{x^3 + 3xy^2 + y^3}$$

$$\frac{x}{x^3}$$

$$x^3 - 3xy^2 + 3xy^2 - y^3 + x^3 + 3xy^2 + y^3 = 153$$

$$x^3 + x^3 + 3xy^2 + 3xy^2 = 153$$

$$3x^3 + 6xy^2 = 153$$

any

① *Prædication*

3 The sum of three numbers in arithmetical progression is 15 and the sum of the square of the 2 extremes is 58 what are the numbers

num bers
 (Step 2 = second
 y - common -
 difference

$$\frac{(x-y)}{x+y} + x + y = 15$$

$$3 \overline{) 15x = 15}$$

$2x = 50$

$$50 + 25^2 = 58$$

25^a = 58-58

2/12/58

$2x = 50$
 $50 + 2y^2 = 58$
 $2y^2 = 58 - 50$
 $2y^2 = 8$
 $y^2 = 4$
 $y = 2$ - 2 common difference

$$3 \overline{) 3x^3 + 6xy^2} = 153$$

$$x^3 + 2xy^2 = 54$$

$$27 + 3 \times 24^2 = 51$$

24 + 632 = 54

63^a = 51-27

169² - 24

3^a - 14 deffas

3 - 2 corniche

4 There are four numbers in arithmetical progression the sum of the squares of the two first is 34 and the sum of the squares of the two last is 130 What are the numbers

$$x, y, x, x+y+z+2y, \text{ and } 3, 3, 7 \text{ and } 9$$

$$\frac{x^2 - xy + y^2}{x^2 - xy + y^2}$$

$$\frac{x^2 - 1}{x^2 - 2x + 1} = 34$$

$$x^2 + 6x + 5y^2 = 130$$

$$418xy + 11y' = 96$$

$$2x + 2y = 24$$

$$2y/xy = 24 - y^2$$

24-50

$$\begin{array}{r} x^2 + 5x + 6 \\ x^2 + 12x + 20 \\ \hline x^2 + 17x + 26 \end{array}$$

$$\begin{array}{r} x + 2y \\ x + 1y \\ \hline x + 4y + 11z \end{array}$$

$$\frac{1152 - 96y^2 + 2y^4 - 48y + 2y^3 + y^2}{4y^2} = 3.4$$

$$\frac{12304y^3 - 192y^3 + 4y^5 - 192y^3 + 8y^3 + 8y^5 = 2y^5}{2304 - 192y^2 + 4y^4 - 192y^2 + 8y^2 + 8y^5}$$

$$\begin{array}{r} 44^4 - 1923^2 - 1983^2 + 83^4 + 83^4 - 2723^2 = 2304 \end{array}$$

$$\begin{array}{r} 2123 \\ -6569^2 \\ \hline 103^2 - 6569^2 \end{array} \quad \begin{array}{r} 404 \\ 2034 \\ \hline 2034 \end{array} \quad \begin{array}{r} 2034 \end{array}$$

44 - 6565 - 23,04

$$y^4 - \frac{164}{5} + \frac{20896}{100} = \frac{26896}{100}$$

$$y^2 - \frac{164}{10} = \sqrt{\frac{18365}{100}} = \frac{124}{10}$$

$$f^2 = \frac{154}{10} + \frac{124}{10} = 64$$

$y = 2$ common differ, ...

Arithmetical

$2x^2 + 4x + 5 = 136$
 $x^2 + 2x + 2.5 = 68$
 $x^2 + 2x = 65.5$
 $x^2 + 2x + 1 = 66.5$
 $(x+1)^2 = 66.5$
 $x+1 = \sqrt{66.5} \approx 8.15$
 $x \approx 7.15$
 A certain number consists of 3 digits which are to each other in arithmetical progression and the number divided by the sum of its digits is equal to 26 but if 173 be added to it the digits will be inverted what is the number

Let x be the first term, y the second, z the third.
 $10(x+y) + z = 111x - 99z = 26 \implies 111x - 99z = 782$
 $111x - 99z - 198 = 104x - 99z = 584$
 $111x - 99z + 198 = 111x - 79z = 980$
 $104x - 99z = 584$
 $111x - 79z = 980$
 $7x - 20z = 396$
 $7x = 396 + 20z$
 $x = 56.57 + 2.85z$
 Since x, y, z are digits, z can only be 1 or 2.
 If $z=1$, $x=59.42$ (not a digit)
 If $z=2$, $x=63.27$ (not a digit)
 Therefore, no solution exists for the given conditions.

The sum of the squares of the extremes of 4 numbers in arithmetical progression is 200 and the sum of the squares of the means is 136 what are the numbers?

Let the numbers be $x-3d, x-d, x+d, x+3d$.
 $(x-3d)^2 + (x-d)^2 + (x+d)^2 + (x+3d)^2 = 200$
 $4x^2 + 16d^2 = 200$
 $x^2 + 4d^2 = 50$
 $(x-d)^2 + (x+d)^2 = 136$
 $2x^2 + 2d^2 = 136$
 $x^2 + d^2 = 68$
 $x^2 + 4d^2 = 50$
 $-3d^2 = -18$
 $d^2 = 6$
 $d = \sqrt{6}$
 $x^2 = 50 - 4(6) = 26$
 $x = \sqrt{26}$
 The numbers are $\sqrt{26} - 3\sqrt{6}, \sqrt{26} - \sqrt{6}, \sqrt{26} + \sqrt{6}, \sqrt{26} + 3\sqrt{6}$.

Geometrical

Find two geometrical means between 4 and 256 Ans. ratio 4

$$\left(\frac{b}{a}\right)^{\frac{1}{n-1}} = r = \left(\frac{256}{4}\right)^{\frac{1}{4-1}} = 4 \text{ ratio}$$

Series 4. 16. 64. 256.

Find three geometrical means between 1 and 9 Ans 1/3 1 3

$$\left(\frac{b}{a}\right)^{\frac{1}{n-1}} = r = \left(\frac{9}{1}\right)^{\frac{1}{3-1}} = 3$$

$$\left(\frac{1}{9}\right)^{\frac{1}{3-1}} = \frac{1}{3} = \frac{1}{3} \div 9 = \frac{1}{3} \times \frac{1}{3} = \left(\frac{1}{3}\right)^{\frac{1}{2}} = \frac{1}{3}$$

$$\left(\frac{1}{3}\right)^{\frac{1}{2}} \times \frac{1}{3} = \frac{1}{3} = \frac{1}{3} \times \frac{1}{3} = 1 \times \frac{1}{3} = 3 \text{ Series } \frac{1}{3}. 1. 3.$$

Ex. 412 Prob 3 What is the sum of the series 1. 3. 9. 27. &c. to 12 terms

$$ar^{n-1} = 1 \times (3)^{11}$$

$$\begin{array}{r} 81 \\ 243 \\ 729 \\ 2187 \\ 6561 \\ 19683 \\ 59049 \\ 3 \times 177147 - 1 = 531440 = 531440 \end{array}$$

What is the sum of 10 terms of the series 1. 3. 9. 27. &c.

$$S = \frac{r^n - 1}{r - 1} = \frac{3^{10} - 1}{3 - 1}$$

$$\frac{1024 - 1}{3 - 1} = \frac{1024 - 1}{2} = \frac{1023}{2} = 511.5$$

$$\frac{58025}{59049} \div \frac{1}{3}$$

$$\frac{58025}{59049} \times 3 = \frac{174075}{59049}$$

Ans

Ex. 444

Prob 1 Find 3 numbers in geometrical progression such that their sum shall be 14 and the sum of their squares 84

Progression

$$2x_2 = \frac{16}{2}$$

$$x_2 = \frac{16}{2}$$

$$x + 4 + \frac{16}{2} = 14$$

$$x^2 + 4x + 16 = 14x$$

$$x^2 - 10x = -16$$

$$x^2 - 10x + 25 = 25 - 16 = 9$$

$$x - 5 = \sqrt{9} = 3$$

$$x = 5 \pm 3 = 8$$

$$x_2 = \frac{16}{x} = \frac{16}{8} = 2$$

$$x_3 = 2$$

$$x = 8 \text{ Answer}$$

$$x^3 = 5^3$$

$$x + y + z = 14$$

$$x^2 + y^2 + z^2 = 84$$

$$1 + 2 + 3 + 2 + 3 + 2 + 3 = 14$$

$$2 + 2 + 2 + 2 + 2 + 2 + 2 = 14$$

$$1 + 1 + 1 + 1 + 1 + 1 + 1 = 14$$

$$x^3 - y^3 = 56 - 14y$$

$$x^3 - y^3 = 56 - 14y$$

$$14/14y = 56$$

$$y = 4$$

2. When are 3 numbers in geometrical progression whose product is 64 and the sum of their cubes is 584 what are the numbers

x = first term
 y = ratio

$$x^3 + x^3y^3 + x^3y^6 = 584$$

$$x^3 + x^3y^3 + x^3y^6 = 584$$

$$520 - 64y^3 = 64$$

$$520 - 64y^3 = 64$$

$$64/64y^3 = 520 - 64$$

$$y^3 = \frac{1584}{64} = 24.75$$

$$y^3 = \frac{1584}{64} = 24.75$$

$$y^3 = \frac{1584}{64} = 24.75$$

$$y = 2$$

$$2, 4, 8 \text{ Ans}$$

$$x^3 \times 8 = 64$$

$$8/8x^3 = 64$$

$$x^3 = 8$$

$$x = 2$$

3. There are three numbers in arithmetical progression the sum of the first and last is 54 and the square of the mean is 100 what are the numbers

x, y, z

$$x^2 = 52x - 100$$

$$x^2 - 52x = -100$$

$$x - 26 = \sqrt{576} = 24$$

$$x = 26 \pm 24 = 50$$

$$x = 30$$

$$x^3 = 52x - 100$$

$$x^3 - 52x = -100$$

$$x^3 - 52x + 100 = 0$$

$$x^3 - 52x + 100 = 0$$

$$x^3 - 52x + 100 = 0$$

$$x^3 - 52x + 100 = 0$$

$$x^3 - 52x + 100 = 0$$

$$x^3 - 52x + 100 = 0$$

$$x^3 - 52x + 100 = 0$$

$$x^3 - 52x + 100 = 0$$

$$100 = 50^2$$

$$50/50 = 100$$

$$3 = 2$$

$$y^2 = 100$$

$$y = \sqrt{100} = 10$$

$$y = 10$$

$$2, 10, 50$$

Ans

Geometrical

4 Of 4 numbers in geometrical progression the sum of the 2 first is 15 and the sum of the 2 last is 60 What are the numbers

Series $x \quad xy \quad xy^2 \quad xy^3$

$$\begin{array}{r} x + xy = 15 \\ 3/3x = 15 \\ x = 5 \end{array} \quad \begin{array}{r} 15/15y = 60 \\ y = 4 \\ y = 2 \end{array} \quad \begin{array}{r} x + xy = 15 \times y^2 \\ xy^2 + xy^3 = 60 \\ xy^2 + xy^3 = 15y^2 \\ xy^2 - 15y^2 = 60 - 15y^2 \end{array}$$

5. 10. 20. 40. Ans

5. A gentleman divided 210£ among 5 servants in such a manner that their portions were in geometrical progression and the first had 90£ more than the last how much had each

Let $x = 1^{st}$
 $y = \text{ratio}$

$$\begin{array}{r} x + xy + xy^2 + xy^3 + xy^4 = 210 \\ x(1 + y + y^2 + y^3 + y^4) = 210 \\ x = \frac{210}{1 + y + y^2 + y^3 + y^4} \end{array}$$

$$\begin{array}{r} x + xy^4 = 90 \\ x(1 + y^4) = 90 \\ x = \frac{90}{1 + y^4} \end{array}$$

$$\frac{210}{1 + y + y^2 + y^3 + y^4} = \frac{90}{1 + y^4}$$

$$210(1 + y^4) = 90(1 + y + y^2 + y^3 + y^4)$$

$$210 + 210y^4 = 90 + 90y + 90y^2 + 90y^3 + 90y^4$$

$$120 + 120y^4 = 90y + 90y^2 + 90y^3$$

$$4 + 4y^4 = 3y + 3y^2 + 3y^3$$

$$4y^4 - 3y^3 - 3y^2 - 3y + 4 = 0$$

$$y = 2$$

$$x = \frac{90}{1 + 2^4} = \frac{90}{17}$$

Ans 30. 60. 120.

6 There are 3 numbers in arithmetical progression the greatest of which exceed the least by 15 and the difference of the squares of the greatest and least is to the sum of the squares of all three numbers as 5 to 7 what are the numbers.

Let $x = \text{first number}$
 $y = \text{ratio}$

$$\begin{array}{r} x, xy, xy^2 \\ x - xy = 15 \\ x(1 - y) = 15 \end{array}$$

$$\frac{x^2 - xy^2}{x^2 + xy^2 + xy^4} = \frac{5}{7}$$

$$\frac{x^2(1 - y^2)}{x^2(1 + y^2 + y^4)} = \frac{5}{7}$$

$$\frac{1 - y^2}{1 + y^2 + y^4} = \frac{5}{7}$$

$$7(1 - y^2) = 5(1 + y^2 + y^4)$$

$$7 - 7y^2 = 5 + 5y^2 + 5y^4$$

$$2 - 12y^2 - 5y^4 = 0$$

Progression

$$\begin{array}{l}
 x + x \times 2 = 15 \\
 x + 2x = 15 \\
 3/3x = 15 \\
 x = 5 \text{ 1st term}
 \end{array}$$

5. 10. 20.

Ans

ratio

$$\begin{array}{l}
 12z^4 - 12 = 10z^4 + 3z^2 \\
 12z^4 - 10z^4 - 3z^2 = 12 \\
 2z^4 - 3z^2 = 12 \\
 z^4 - \frac{3}{2}z^2 = 6 \\
 z^4 - \frac{3}{2}z^2 + \frac{9}{16} = \frac{25}{16} + 6 = \frac{121}{16} \\
 z^2 - \frac{3}{4} = \sqrt{\frac{121}{16}} = \frac{11}{4} \\
 z^2 = \frac{3}{4} + \frac{11}{4} = 4
 \end{array}$$

$$z^2 = \frac{3}{4} + \frac{11}{4} = 4$$

$$z = 2 \text{ ratio}$$

There are 4 numbers in geometrical progression the second of which is less than the fourth by 24 and the sum of the extremes is to the sum of the means as 7 to 3 what are the numbers

Ans 1. 3. 9. 27.

Sup x = first term

x. xy. xy^2. xy^3

y = ratio

$$x | x + xy^3 : xy + xy^2 :: 7 : 3 \text{ second equation}$$

$$1 + y^3 : y + y^2 :: 7 : 3$$

$$y + 1 | y^3 + y^2 + y + 1 : y + y^2 :: 10 : 3$$

$$y^2 + 1 : y :: 10 : 3$$

$$3y^2 + 3 = 10y$$

$$3 | 3y^2 - 10y = -3$$

$$y^2 - \frac{10}{3}y = -1$$

$$y^2 - \frac{10}{3}y + \frac{100}{36} = \frac{100}{36} - 1 = \frac{64}{36}$$

$$y - \frac{10}{6} = \sqrt{\frac{64}{36}} = \frac{8}{6}$$

$$y = \frac{10}{6} + \frac{8}{6} = 3 \text{ Ratio}$$

$$xy^3 - xy = 24 \text{ first equation}$$

$$x \times 27 - x \times 3 = 24$$

$$24x - 3x = 24$$

$$24 | 24x = 24$$

$$x = 1 \text{ First term}$$

1. 3. 9. 27 Answer.

Division By

Prob. 14

Divide $arvy + arvy + ry$ by $a + vy$ Ans $1 + rvy$
 $arvy$ $1arvy + arvy + ry$ $(1 + rvy)$

$$\frac{arvy + ry}{arvy + ry}$$

15 Divide $x^3 - 3ax^2 + 3a^2x - a^3$ by $x - a$

$$\begin{array}{r} x-a \overline{) x^3 - 3ax^2 + 3a^2x - a^3} \\ \underline{x^3 - ax^2} \\ -2ax^2 + 3a^2x \\ \underline{-2ax^2 + 4ax} \\ ax - a^3 \\ \underline{ax - a^3} \\ 0 \end{array}$$

16 Divide $9z^3 - 19z^2 + 26z - 17$ by $z - 8$

$$\begin{array}{r} z-8 \overline{) 9z^3 - 19z^2 + 26z - 17} \\ \underline{9z^3 - 72z^2} \\ 53z^2 + 26z \\ \underline{53z^2 - 424z} \\ 447z - 17 \\ \underline{447z - 3552} \\ 3535 \end{array}$$

17 Divide $x^6 - 1$ by $x - 1$

$$\begin{array}{r} x-1 \overline{) x^6 - 1} \\ \underline{x^6 - x^5} \\ x^5 \\ \underline{x^5 - x^4} \\ x^4 \\ \underline{x^4 - x^3} \\ x^3 \\ \underline{x^3 - x^2} \\ x^2 \\ \underline{x^2 - x} \\ x \\ \underline{x - 1} \\ 0 \end{array}$$

18 Divide $4x^3 - 7x^2 + 6x - 8$ by $2x^2 + 3x - 1$

$$\begin{array}{r} 2x^2+3x-1 \overline{) 4x^3 - 7x^2 + 6x - 8} \\ \underline{4x^3 + 6x^2 - 2x} \\ -13x^2 + 8x \\ \underline{-13x^2 - 39x + 13} \\ 47x - 5 \end{array}$$

19 (F)

Divide $a^4 + 4a^3b + 3b^4$ by $a + 2b$

$$\begin{array}{r} a+2b \overline{) a^4 + 4a^3b + 3b^4} \\ \underline{a^4 + 2a^3b} \\ 2a^3b \\ \underline{2a^3b + 4a^2b^2} \\ -4a^2b^2 \\ \underline{-4a^2b^2 - 8ab^3} \\ 8ab^3 \\ \underline{8ab^3 + 16a^2b^4} \\ -16a^2b^4 \\ \underline{-16a^2b^4 - 32b^5} \\ 32b^5 \\ \underline{32b^5 + 64ab^6} \\ 64ab^6 \end{array}$$

Ans

Compound Divisors

20 Divide $x^4 - a^2x^2 + 2a^2x - a^4$ by $x^2 - ax + a^2$

$$\begin{array}{r} x^2 - ax + a^2 \overline{) x^4 - a^2x^2 + 2a^2x - a^4} \\ \underline{x^4 - ax^3 + a^2x^2} \\ ax^3 - 2a^2x^2 + 2a^2x \\ \underline{ax^3 - a^2x^2 + a^3x} \\ -a^2x^2 + a^3x - a^4 \\ \underline{-a^2x^2 + a^3x - a^4} \\ 0 \end{array}$$

Ans $x^2 - ax + a^2$

Common Measure

Art 166. Prob 9 What is the greatest common measure of $x^3 - 6x^2$ and $x^2 + 2bx + b^2$ Ans $x + b$

$$\begin{array}{r} x^3 - 6x^2 \\ \underline{x^3 - 6x^2} \\ 0 \end{array}$$

$$\begin{array}{r} x^2 + 2bx + b^2 \\ \underline{x^2 + 2bx + b^2} \\ 0 \end{array}$$

common measure $x + b$

3 What is the greatest common measure of $cx + x^2$ and $a^2c + a^2x$

$$\begin{array}{r} cx + x^2 \\ \underline{cx + x^2} \\ 0 \end{array}$$

$$\begin{array}{r} a^2c + a^2x \\ \underline{a^2c + a^2x} \\ 0 \end{array}$$

common measure $c + x$

14 What is the greatest common measure of $3x^3 - 24x - 9$ and $2x^3 - 16x - 6$ Ans $x^2 - 8x - 3$

$$\begin{array}{r} 3 \overline{) 3x^3 - 24x - 9} \\ \underline{x^3 - 8x - 3} \end{array}$$

$$\begin{array}{r} 2 \overline{) 2x^3 - 16x - 6} \\ \underline{x^3 - 8x - 3} \end{array}$$

5 What is the greatest common measure of $a^4 - b^4$ and $a^3 - b^3$ Ans $a^2 - b^2$

$$\begin{array}{r} a^4 - b^4 \\ \underline{a^4 - b^4} \\ 0 \end{array}$$

$$\begin{array}{r} a^3 - b^3 \\ \underline{a^3 - b^3} \\ 0 \end{array}$$

common measure $a^2 - b^2$

6 What is the greatest common measure of $x^2 - 1$ and $x^2 + 1$ Ans $x + 1$

$$\begin{array}{r} x^2 - 1 \\ \underline{x^2 + 1} \\ -2 \end{array}$$

$$\begin{array}{r} x^2 + 1 \\ \underline{x^2 - 1} \\ 2 \end{array}$$

common measure $x + 1$

7 What is the greatest common measure of $x^3 - a^3$ and $x^4 - a^4$

$$\begin{array}{r} x^3 - a^3 \\ \underline{x^4 - a^4} \\ x^4 - a^4 \end{array}$$

$$\begin{array}{r} x^3 - a^3 \\ \underline{x^4 - a^4} \\ x^4 - a^4 \end{array}$$

divide by $x^4 - a^4$

$$\begin{array}{r} x^4 - a^4 \\ \underline{x^4 - a^4} \\ 0 \end{array}$$

common measure $x^2 - a^2$

3) What is the greatest common measure of $a^2 - ab + b^2$ and $a^2 - 3ab + 2b^2$ Ans $a - b$

$$\begin{array}{r} a^2 - ab + b^2 \overline{) a^2 - 3ab + 2b^2} \\ \underline{a^2 - ab + b^2} \\ -2ab + b^2 \\ \underline{-2ab + 2b^2} \\ 0 \end{array}$$

divide by $2b$ $\frac{2ab - 4b^2}{a - 2b}$ $\frac{a^2 - ab + b^2}{a - 2b} \overline{) a^2 - 3ab + 2b^2}$

$$\begin{array}{r} a - 2b \overline{) a^2 - 3ab + 2b^2} \\ \underline{a^2 - 2ab} \\ -ab + 2b^2 \\ \underline{-ab + 2b^2} \\ 0 \end{array}$$

4) What is the greatest common measure of $a^4 - x^4$ and $a^3 - ax^2 - ax^2 + x^3$ Ans $a^2 - x^2$

$$\begin{array}{r} a^4 - x^4 \overline{) a^4 - ax^2 - ax^2 + x^3} \\ \underline{a^4 - ax^2} \\ -ax^2 + x^3 \\ \underline{-ax^2 + x^3} \\ 0 \end{array}$$

$$\begin{array}{r} a^2 - x^2 \overline{) a^4 - x^4} \\ \underline{a^4 - a^2x^2} \\ a^2x^2 - x^4 \\ \underline{a^2x^2 - a^2x^2} \\ 0 \end{array}$$

5) What is the greatest common measure of $a^3 - ab^2$ and $a^3 + 2ab + b^3$

$$\begin{array}{r} a^3 - ab^2 \overline{) a^3 + 2ab + b^3} \\ \underline{a^3 - ab^2} \\ 3ab + b^3 \\ \underline{3ab + 3b^2} \\ -b^2 \\ \underline{-b^2 - b^3} \\ 0 \end{array}$$

$$\begin{array}{r} a + b \overline{) a^3 - ab^2} \\ \underline{a^3 + ab^2} \\ -2ab^2 \\ \underline{-2ab^2 - 2b^3} \\ 2b^3 \\ \underline{2b^3 + 2b^2} \\ 0 \end{array}$$

common measure $a + b$

Evolution of Binomials

Expand into a series $(1+x)^{\frac{1}{2}}$

$$(1+x)^{\frac{1}{2}} = 1 + \frac{1}{2}x + \frac{1}{2} \times \frac{-\frac{1}{2}}{2}x^2 + \frac{1}{2} \times \frac{-\frac{1}{2}}{2} \times \frac{-\frac{3}{2}}{6}x^3 + \frac{1}{2} \times \frac{-\frac{1}{2}}{2} \times \frac{-\frac{3}{2}}{6} \times \frac{-\frac{5}{2}}{24}x^4$$

$$\frac{1}{2} \times \frac{-\frac{1}{2}}{2} = \frac{1}{2} \times \frac{-1}{4} = \frac{-1}{8}$$

$$\frac{1}{2} \times \frac{-\frac{3}{2}}{6} = \frac{1}{2} \times \frac{-3}{12} = \frac{-3}{24}$$

$$\frac{3}{24} \times \frac{-\frac{5}{2}}{24} = \frac{3}{24} \times \frac{-5}{48} = \frac{-15}{1152}$$

$$(1+x)^{\frac{1}{2}} = 1 + \frac{x}{2} - \frac{x^2}{8} + \frac{3x^3}{256} - \frac{5x^4}{16384} \text{ Ans}$$

Evolution of Binomials

3 Expand $(1+x)^{\frac{1}{2}}$ or $(1+x)^{\frac{1}{2}}$

$$(1+x)^{\frac{1}{2}} = 1 + \frac{1}{2}x + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} x^2 + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} x^3 + \dots$$

$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \times \frac{1}{2} = \frac{1}{8} \text{ coefficient of the third term}$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \times \frac{1}{2} = \frac{1}{16} \text{ coefficient of the fourth term}$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16} \times \frac{1}{2} = \frac{1}{32} \text{ coefficient of the fifth term}$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{32} \times \frac{1}{2} = \frac{1}{64} \text{ coefficient of the sixth term}$$

$$(1+x)^{\frac{1}{2}} = 1 + \frac{1}{2}x - \frac{1}{8}x^2 + \frac{1}{16}x^3 - \frac{5}{128}x^4 + \frac{7}{2048}x^5 - \dots$$

4 Expand $(a+x)^{\frac{1}{2}}$ or $a^{\frac{1}{2}}x(1+\frac{x}{a})^{\frac{1}{2}}$

$$(a+x)^{\frac{1}{2}} = a^{\frac{1}{2}}x(1+\frac{x}{a})^{\frac{1}{2}} = a^{\frac{1}{2}}x(1 + \frac{1}{2}\frac{x}{a} - \frac{1}{8}\frac{x^2}{a^2} + \frac{1}{16}\frac{x^3}{a^3} - \frac{5}{128}\frac{x^4}{a^4} + \dots)$$

$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \times \frac{1}{2} = \frac{1}{16}$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16} \times \frac{1}{2} = \frac{1}{32}$$

$$a^{\frac{1}{2}}x(1+\frac{x}{a})^{\frac{1}{2}} = a^{\frac{1}{2}}x(1 + \frac{1}{2}\frac{x}{a} - \frac{1}{8}\frac{x^2}{a^2} + \frac{1}{16}\frac{x^3}{a^3} - \frac{5}{128}\frac{x^4}{a^4} + \dots)$$

5 Expand $(a+b)^{\frac{1}{2}}$ or $a^{\frac{1}{2}}x(1+\frac{b}{a})^{\frac{1}{2}}$

$$(a+b)^{\frac{1}{2}} = a^{\frac{1}{2}}x(1+\frac{b}{a})^{\frac{1}{2}} = a^{\frac{1}{2}}x(1 + \frac{1}{2}\frac{b}{a} - \frac{1}{8}\frac{b^2}{a^2} + \frac{1}{16}\frac{b^3}{a^3} - \frac{5}{128}\frac{b^4}{a^4} + \dots)$$

$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \times \frac{1}{2} = \frac{1}{16}$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16} \times \frac{1}{2} = \frac{1}{32}$$

$$a^{\frac{1}{2}}x(1+\frac{b}{a})^{\frac{1}{2}} = a^{\frac{1}{2}}x(1 + \frac{1}{2}\frac{b}{a} - \frac{1}{8}\frac{b^2}{a^2} + \frac{1}{16}\frac{b^3}{a^3} - \frac{5}{128}\frac{b^4}{a^4} + \dots)$$

6 Expand into a series $(a-b)^{\frac{1}{2}}$

$$(a-b)^{\frac{1}{2}} = a^{\frac{1}{2}}x(1-\frac{b}{a})^{\frac{1}{2}} = a^{\frac{1}{2}}x(1 - \frac{1}{2}\frac{b}{a} + \frac{1}{8}\frac{b^2}{a^2} - \frac{1}{16}\frac{b^3}{a^3} + \frac{5}{128}\frac{b^4}{a^4} - \dots)$$

$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8} \times \frac{1}{2} = \frac{1}{16}$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16} \times \frac{1}{2} = \frac{1}{32}$$

$$a^{\frac{1}{2}}x(1-\frac{b}{a})^{\frac{1}{2}} = a^{\frac{1}{2}}x(1 - \frac{1}{2}\frac{b}{a} + \frac{1}{8}\frac{b^2}{a^2} - \frac{1}{16}\frac{b^3}{a^3} + \frac{5}{128}\frac{b^4}{a^4} - \dots)$$

Binomial

Expand $(a+x)^{-1}$

$$(a+x)^{-1} = a^{-1} \left(1 + \frac{x}{a}\right)^{-1} = 1 - \frac{x}{a} + \frac{1}{a^2} x^2 - \frac{1}{a^3} x^3 + \frac{1}{a^4} x^4$$

$$1 \times \frac{1}{1} = 1 \times \frac{1}{1} = 1$$

$$\frac{1}{1} \times \frac{-1}{1} = \frac{-1}{1} = -1$$

$$\frac{1}{1} \times \frac{1}{1} = \frac{1}{1} = 1$$

$$(a+x)^{-1} = a^{-1} \left(1 - \frac{x}{a} + \frac{1}{a^2} x^2 - \frac{1}{a^3} x^3 + \frac{1}{a^4} x^4\right) \text{ Ans}$$

Expand $(1+x)^{-1}$

$$(1+x)^{-1} = 1 - x + x^2 - x^3 + x^4$$

$$1 \times \frac{1}{1} = 1 \times \frac{1}{1} = 1$$

$$\frac{1}{1} \times \frac{-1}{1} = \frac{-1}{1} = -1$$

$$\frac{1}{1} \times \frac{1}{1} = \frac{1}{1} = 1$$

$$(1+x)^{-1} = 1 - x + x^2 - x^3 + x^4 \text{ Ans}$$

Expand $(1+x)^{-2}$

$$(1+x)^{-2} = 1 - 2x + 3x^2 - 4x^3 + 5x^4$$

$$1 \times \frac{1}{1} = 1 \times \frac{1}{1} = 1$$

$$\frac{1}{1} \times \frac{-2}{1} = \frac{-2}{1} = -2$$

$$\frac{1}{1} \times \frac{3}{1} = \frac{3}{1} = 3$$

$$(1+x)^{-2} = 1 - 2x + 3x^2 - 4x^3 + 5x^4 \text{ Ans}$$

Expand $(a+x)^{-2}$

$$(a+x)^{-2} = a^{-2} \left(1 + \frac{x}{a}\right)^{-2} = \frac{1}{a^2} \left(1 - \frac{2x}{a} + \frac{3x^2}{a^2} - \frac{4x^3}{a^3} + \frac{5x^4}{a^4}\right)$$

$$1 \times \frac{1}{1} = 1 \times \frac{1}{1} = 1$$

$$\frac{1}{1} \times \frac{-2}{1} = \frac{-2}{1} = -2$$

$$(a+x)^{-2} = \frac{1}{a^2} \left(1 - \frac{2x}{a} + \frac{3x^2}{a^2} - \frac{4x^3}{a^3} + \frac{5x^4}{a^4}\right) \text{ Ans}$$

Expand $(1+x)^{-2}$

$$(1+x)^{-2} = 1 - 2x + 3x^2 - 4x^3 + 5x^4$$

Binomials

It has the 8th power of $a+b$
 $(a+b)^8 = a^8 + 8a^7b + 28a^6b^2 + 56a^5b^3 + 70a^4b^4 + 56a^3b^5 + 28a^2b^6 + 8ab^7 + b^8$
 $8 \times 7 = 56$ 3rd term

$$15 \times 7 = 105$$

$$36 \times 7 = 252$$

$$70 \times 7 = 490$$

$$56 \times 7 = 392$$

$$28 \times 7 = 196$$

It has the 7th power of $a+b$
 $(a+b)^7 = a^7 + 7a^6b + 21a^5b^2 + 35a^4b^3 + 35a^3b^4 + 21a^2b^5 + 7ab^6 + b^7$
 $7 \times 6 = 42$ 3rd term

It has the 6th power of $a+b$
 $(a+b)^6 = a^6 + 6a^5b + 15a^4b^2 + 20a^3b^3 + 15a^2b^4 + 6ab^5 + b^6$
 $6 \times 5 = 30$ 3rd term

It has the 5th power of $a+b$
 $(a+b)^5 = a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$
 $5 \times 4 = 20$ 3rd term

$$21 \times 5 = 105$$

$$35 \times 5 = 175$$

$$35 \times 4 = 140$$

$$21 \times 4 = 84$$

$$10 \times 4 = 40$$

$$5 \times 4 = 20$$

$$1 \times 4 = 4$$

$$1 \times 3 = 3$$

$$1 \times 2 = 2$$

$$1 \times 1 = 1$$

$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

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$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

$$1 \times 0 = 0$$

Binomial

Expand into a series $(a+y)^{-4}$

$$(a+y)^{-4} = a^{-4} + a^{-5}y + a^{-6}y^2 + a^{-7}y^3 + a^{-8}y^4$$

$$-4 \times 3 = 12$$

$$12 \times 3 = 36$$

$$-20 \times 3 = 60 \quad (a+y)^{-4} = \frac{1}{a^4} - \frac{4y}{a^5} + \frac{10y^2}{a^6} - \frac{20y^3}{a^7} + \frac{35y^4}{a^8} \text{ Ans}$$

Expand into a series $(c^2+x^2)^5$

substituting $a+y$ for c^2+x^2

$$a^5(1+\frac{y}{a})^5 = 1^5 + 5\frac{y}{a} + 10\frac{y^2}{a^2} + 10\frac{y^3}{a^3} + 5\frac{y^4}{a^4} + 1^5$$

$$\frac{1}{5} \times \frac{5}{1} = \frac{1}{1} \times \frac{5}{1} = 5$$

$$\frac{5}{2} \times \frac{4}{2} = \frac{5}{1} \times \frac{2}{1} = 10$$

$$(c^2+x^2)^5 = (c^2)^5 x (1+\frac{x^2}{c^2})^5 = c^5 x (1 + \frac{5x^2}{c^2} - \frac{10x^4}{c^4} + \frac{10x^6}{c^6} - \frac{5x^8}{c^8} + 1) \text{ Ans}$$

Expand $(c^2+x^2)^{-5}$

$$d(c^2+x^2)^{-5} = dx(c^2)^{-5} (1+\frac{x^2}{c^2})^{-5} = \frac{1}{c^{10}} (1 - \frac{5x^2}{c^2} + \frac{15x^4}{c^4} - \frac{15x^6}{c^6} + \frac{5x^8}{c^8})$$

$$dx(c^2)^{-5} = \frac{dx}{c^{10}}$$

$$-\frac{1}{2} \times \frac{5}{2} = -\frac{5}{4}$$

$$\frac{5}{2} \times \frac{4}{2} = \frac{5}{1} \times \frac{2}{1} = 10$$

$$-\frac{10}{2} \times \frac{3}{2} = -\frac{15}{2}$$

$$\frac{d}{dx} (1 - \frac{5x^2}{c^2} + \frac{15x^4}{c^4} - \frac{15x^6}{c^6} + \frac{5x^8}{c^8})$$

Ans

Find the 5th power $(a+y)^5$

$$(b+x)^5 = b^5 + 5b^4x + 10b^3x^2 + 10b^2x^3 + 5bx^4 + x^5 \text{ Substituting } b \text{ for } a$$

$$5 \times 4 = 20$$

$$10 \times 3 = 30$$

$$10 \times 2 = 20$$

$$(b+x)^5 = b^5 + 5b^4x + 10b^3x^2 + 10b^2x^3 + 5bx^4 + x^5$$

$$(a^2+y)^5 = a^{10} + 5a^8y + 10a^6y^2 + 10a^4y^3 + 5a^2y^4 + y^5 \text{ Ans}$$

Substituting a^2+y

Find the 4th power of $(a+b+x)$

Substituting b for $a+x$

$$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$$

$$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$$

$$(a+b+x)^4 = a^4 + 4a^3x + 6a^2x^2 + 4ax^3 + x^4$$

Substituting $b+x$

Ans

Binomials by 11

11 Expand $(a^2 - x)^{\frac{1}{2}}$

$$(a^2 - x)^{\frac{1}{2}} = a^2 x (1 - \frac{x}{a^2})^{\frac{1}{2}} = 1^{\frac{1}{2}} - 1^{\frac{1}{2}} \frac{x}{a^2} + 1^{\frac{1}{2}} \frac{2 \cdot \frac{1}{2} x^2}{a^4} - 1^{\frac{1}{2}} \frac{3 \cdot \frac{1}{2} x^3}{a^6} \text{ etc}$$

$$a^2 (1 - \frac{x}{a^2})^{\frac{1}{2}} = a^2 x (1 - \frac{x}{a^2})^{\frac{1}{2}} = \frac{x}{2a^2} - \frac{x^2}{2 \cdot 4 a^6} - \frac{3x^3}{2 \cdot 4 \cdot 6 a^9} \text{ etc}$$

$$\frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{2 \cdot 4}$$

12 Expand $(1 - y^2)^{\frac{1}{2}}$ // $(1 - y^2)^{\frac{1}{2}} = 1^{\frac{1}{2}} - 1^{\frac{1}{2}} y^2 + 1^{\frac{1}{2}} \frac{2 \cdot \frac{1}{2} y^4}{2} - 1^{\frac{1}{2}} \frac{3 \cdot \frac{1}{2} y^6}{2 \cdot 4} \text{ etc}$

$$\frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{2 \cdot 4}$$

$$-\frac{1}{2} x^{-\frac{3}{2}} = -\frac{1}{2} x^{-\frac{3}{2}} = -\frac{3}{2 \cdot 4 \cdot 6}$$

$$(1 - y^2)^{\frac{1}{2}} = 1 - \frac{y^2}{2} - \frac{y^4}{2 \cdot 4} - \frac{3y^6}{2 \cdot 4 \cdot 6} \text{ (Ans)}$$

13 Expand $(a - x)^{\frac{1}{3}}$

$$(a - x)^{\frac{1}{3}} = a^{\frac{1}{3}} x (1 - \frac{x}{a})^{\frac{1}{3}} = 1^{\frac{1}{3}} - 1^{\frac{1}{3}} \frac{x}{a} + 1^{\frac{1}{3}} \frac{3 \cdot \frac{1}{3} x^2}{a^2} - 1^{\frac{1}{3}} \frac{4 \cdot \frac{1}{3} x^3}{a^3} \text{ etc}$$

$$\frac{1}{3} x^{-\frac{2}{3}} = \frac{1}{3} x^{-\frac{2}{3}} = -\frac{2}{3 \cdot 6}$$

$$-\frac{2}{3 \cdot 6} x^{-\frac{5}{3}} = -\frac{2}{3 \cdot 6} x^{-\frac{5}{3}} = -\frac{2 \cdot 5}{3 \cdot 6 \cdot 9}$$

$$a^{\frac{1}{3}} x (1 - \frac{x}{a})^{\frac{1}{3}} = a^{\frac{1}{3}} x (1 - \frac{x}{a} - \frac{2x^2}{3 \cdot 6 a^2} - \frac{4 \cdot 5 x^3}{3 \cdot 6 \cdot 9 a^3}) \text{ etc}$$

14 Expand $h(a^2 - y)^{\frac{1}{3}}$ $h(a^2 - y)^{\frac{1}{3}} = h x (a^2 - y)^{\frac{1}{3}} = h x (1 - \frac{y}{a^2})^{\frac{1}{3}}$

$$h(a^2)^{\frac{1}{3}} x (1 - \frac{y}{a^2})^{\frac{1}{3}} = 1^{\frac{1}{3}} - 1^{\frac{1}{3}} \frac{y}{a^2} + 1^{\frac{1}{3}} \frac{3 \cdot \frac{1}{3} y^2}{a^4} - 1^{\frac{1}{3}} \frac{4 \cdot \frac{1}{3} y^3}{a^6} \text{ etc}$$

$$\frac{1}{3} x^{-\frac{2}{3}} = \frac{1}{3} x^{-\frac{2}{3}} = -\frac{2}{3 \cdot 6}$$

$$-\frac{2}{3 \cdot 6} x^{-\frac{5}{3}} = -\frac{2}{3 \cdot 6} x^{-\frac{5}{3}} = -\frac{2 \cdot 5}{3 \cdot 6 \cdot 9} \quad (h x (a^2)^{\frac{1}{3}} h a)$$

$$h x (a^2)^{\frac{1}{3}} x (1 - \frac{y}{a^2})^{\frac{1}{3}} = a h x (1 - \frac{y}{a^2} - \frac{2y^2}{3 \cdot 6 a^4} - \frac{4 \cdot 5 y^3}{3 \cdot 6 \cdot 9 a^6} \text{ etc}$$

(Ans)

Evolution of

11 What is the 5th root of $a^5 - 5a^4b + 10a^3b^2 - 10a^2b^3 + 5ab^4 - b^5$ Ans $a-b$

$$\begin{array}{r} a^5 - 5a^4b + 10a^3b^2 - 10a^2b^3 + 5ab^4 - b^5 \\ 5a^4 \overline{) 15a^4b} \\ \underline{15a^4b} \\ 5a^4b \end{array}$$

$a^5 - 5a^4b + 10a^3b^2 - 10a^2b^3 + 5ab^4 - b^5$ The 5th power of $a-b$

12 What is the cube root of $a^3 - 6a^2b + 12ab^2 - 8b^3$ Ans $a-2b$

$$\begin{array}{r} a^3 - 6a^2b + 12ab^2 - 8b^3 \\ 3a^2 \overline{) -6a^2b} \\ \underline{-6a^2b} \\ 12ab^2 \\ 6a \overline{) 12ab^2} \\ \underline{12ab^2} \\ -8b^3 \end{array}$$

13 What is the square root of $a^6 - 2a^5 + 3a^4 - 2a^3 + a^2$ Ans $a^3 - a^2 + a$

$$\begin{array}{r} a^6 - 2a^5 + 3a^4 - 2a^3 + a^2 \\ 2a^3 \overline{) -2a^5 + 3a^4} \\ \underline{-2a^5 + 3a^4} \\ 3a^4 - 2a^3 + a^2 \\ 3a^3 \overline{) 3a^4 - 2a^3 + a^2} \\ \underline{3a^4 - 2a^3 + a^2} \\ 0 \end{array}$$

14 What is the square root of $a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$ Ans $a^2 + 2ab + b^2$

$$\begin{array}{r} a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4 \\ 2a^2 \overline{) 4a^3b + 6a^2b^2 + 4ab^3} \\ \underline{4a^3b + 4a^2b^2} \\ 2a^2b^2 + 4ab^3 + b^4 \\ 2ab \overline{) 2a^2b^2 + 4ab^3 + b^4} \\ \underline{2a^2b^2 + 4ab^3 + 2ab^2} \\ 2ab^2 + b^4 \\ 2ab \overline{) 2ab^2 + b^4} \\ \underline{2ab^2 + 2ab^2} \\ b^4 \end{array}$$

15 Find the square root of $x^4 - 4x^3 + 6x^2 - 4x + 1$ Ans $x^2 - 2x + 1$

$$\begin{array}{r} x^4 - 4x^3 + 6x^2 - 4x + 1 \\ 2x^2 \overline{) -4x^3 + 6x^2 - 4x + 1} \\ \underline{-4x^3 + 6x^2 - 4x} \\ 2x^2 - 4x + 1 \\ 2x^2 \overline{) 2x^2 - 4x + 1} \\ \underline{2x^2 - 4x + 1} \\ 0 \end{array}$$

16 Find the cube root of $x^6 - 6x^5 + 15x^4 - 20x^3 + 15x^2 - 6x + 1$ Ans $x^2 - 2x + 1$

$$\begin{array}{r} x^6 - 6x^5 + 15x^4 - 20x^3 + 15x^2 - 6x + 1 \\ 3x^4 \overline{) -6x^5 + 15x^4 - 20x^3 + 15x^2 - 6x + 1} \\ \underline{-6x^5 + 15x^4 - 20x^3 + 15x^2 - 6x} \\ 15x^4 - 20x^3 + 15x^2 - 6x + 1 \\ 3x^3 \overline{) 15x^4 - 20x^3 + 15x^2 - 6x + 1} \\ \underline{15x^4 - 20x^3 + 15x^2 - 6x} \\ 15x^2 - 6x + 1 \\ 3x \overline{) 15x^2 - 6x + 1} \\ \underline{15x^2 - 6x} \\ 1 \end{array}$$

17 Find the square root of $4x^4 - 4x^3 + 15x^2 - 6x + 9$ Ans $2x^2 - x + 3$

$$\begin{array}{r} 4x^4 - 4x^3 + 15x^2 - 6x + 9 \\ 2x^2 \overline{) -4x^3 + 15x^2 - 6x + 9} \\ \underline{-4x^3 + 15x^2 - 6x} \\ 15x^2 - 6x + 9 \\ 2x^2 \overline{) 15x^2 - 6x + 9} \\ \underline{15x^2 - 6x + 9} \\ 0 \end{array}$$

Compound Quantities.

Find the fourth root of $16a^4 - 46a^3x + 216a^2x^2 - 216ax^3 + 81x^4$ by the

$$\begin{array}{r} 16a^4 - 46a^3x + 216a^2x^2 - 216ax^3 + 81x^4 \quad 2a - 3x \quad (4a - 3x) \\ \underline{32a^3 - 96a^2x} \quad - 4a^3 + 12a^2x \\ \underline{16a^4 - 46a^3x + 216a^2x^2 - 216ax^3 + 81x^4} \quad 16a^4 - 46a^3x + 216a^2x^2 - 216ax^3 + 81x^4 \quad 4a - 3x \end{array}$$

5 Find the 5th root of $x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$ by the Binomial

The 8th power of $x+1 = \frac{3x^8 + 3x^4}{x^2 + 1} = x^6 + 10x^3 + 10x + 1$

To find the 6th root of $a^6c^6b^6 + 15a^4b^2c^4 + 20a^3b^3c^3 + 15a^2b^4c^2 + 10ab^5c + b^6$ - 3rd Edition
 $a^6c^6b^6 + 15a^4b^2c^4 + 20a^3b^3c^3 + 15a^2b^4c^2 + 10ab^5c + b^6$ - 3rd Edition
 $2a^2 - 3ab + 6a^2b^2 + 15a^3b^3$ - 3rd Edition
 $2a^3 - 6a^2b + 3ab^2 + 6a^2b^2 - 18a^3b^3 + 15a^4b^4$ - 3rd Edition
 $2a^2c^6b^6 + 15$ - 3rd Edition
 $2a^3b^3 + 6a^2b^2c^4 - 6ab^5c + b^6$ - 3rd Edition
 $2a^3b^3 + 6a^2b^2c^4 - 6ab^5c + b^6$ - 3rd Edition
 $a^3 - 3a^2b + 3ab^2 - b^3$ - 3rd Edition
 $3a^2b - 3a^2b$ - 3rd Edition
 $a^3 - 3a^2b + 3ab^2 - b^3$ - 3rd Edition

Roots of Binomials Surds

$$a + b = x + 1$$

$$a - b = x - 1$$

$$a + b = x^2 + 2x + 1$$

$$a - b = x^2 - 2x + 1$$

$$2a = 2x^2 + 2$$

$$a = x^2 + 1$$

$$a - b = x^2 - 2x + 1$$

$$b = 2x$$

$$\frac{a + \sqrt{a^2 - c}}{a - \sqrt{a^2 - c}} = \frac{1}{x} = \frac{1}{\sqrt{a + \frac{1}{4}a^2 - c}}$$

$$\sqrt{a+ib} = \sqrt{\frac{a+\sqrt{a^2+b^2}}{2}} + i \sqrt{\frac{a-\sqrt{a^2+b^2}}{2}}$$

$$\gamma_a + \gamma_b = \gamma_{a^1} + \gamma_{a^2} = \gamma_{a^1} + \gamma_{a^2} = \gamma_{a^1} + \gamma_{a^2}$$

$$\sqrt{a+bi} = \sqrt{1+6i} = \sqrt{1+\frac{6i^2-7}{2}} + i\sqrt{1+\frac{6i^2+7}{2}}$$

$$\sqrt{11+6\sqrt{2}} = \sqrt{11+\frac{7}{2}} + \sqrt{11-\frac{7}{2}}$$

$$f(1) = 3 + 1 = 4$$

Roots of Binomials Surd

3 Find the square root of $6-2\sqrt{5}$ Ans $\sqrt{5}-1$

$$\sqrt{a+b} = \sqrt{a} + \sqrt{a+b} + \sqrt{a-b}$$

$$\sqrt{a-b} = \sqrt{a} - \sqrt{a+b} - \sqrt{a-b}$$

$$\sqrt{6-2\sqrt{5}} = \sqrt{6+2\sqrt{5}-20} - \sqrt{6-2\sqrt{5}-20}$$

$$\sqrt{6+2\sqrt{5}} - \sqrt{6+4} - \sqrt{6-4} =$$

$$\sqrt{6+2\sqrt{5}} - \sqrt{10} - \sqrt{2} = 1 \text{ Ans}$$

4 Find the square root of $7+4\sqrt{3}$ Ans $2+\sqrt{3}$

$$\sqrt{a+b} = \sqrt{a} + \sqrt{a+b} + \sqrt{a-b}$$

$$\sqrt{a-b} = \sqrt{a} - \sqrt{a+b} - \sqrt{a-b}$$

$$\sqrt{7+4\sqrt{3}} = \sqrt{7+4\sqrt{3}-48} + \sqrt{7-4\sqrt{3}-48}$$

$$\sqrt{7+4\sqrt{3}} - \sqrt{7+1} + \sqrt{7-1}$$

$$\sqrt{7+4\sqrt{3}} = 2 + \sqrt{3} \text{ Ans}$$

5 Find the square root of $7-2\sqrt{10}$ Ans $\sqrt{5}-2$

$$\sqrt{a+b} = x+y$$

$$\sqrt{a-b} = x-y$$

$$\sqrt{a+b} + \sqrt{a-b} = 2x$$

$$7-2\sqrt{10} = 2x^2 - y^2$$

$$x^2 - y^2 = 7-2\sqrt{10}$$

$$x^2 - y^2 = 7-2\sqrt{10}$$

$$\sqrt{a+b} = \sqrt{a} + \sqrt{a+b} + \sqrt{a-b}$$

$$\sqrt{a-b} = \sqrt{a} - \sqrt{a+b} - \sqrt{a-b}$$

$$\sqrt{a+b} = \sqrt{a} + \sqrt{a+b} + \sqrt{a-b}$$

$$\sqrt{a-b} = \sqrt{a} - \sqrt{a+b} - \sqrt{a-b}$$

$$\sqrt{7-2\sqrt{10}} = \sqrt{7+2\sqrt{10}-40} - \sqrt{7-2\sqrt{10}-40}$$

$$\sqrt{7-2\sqrt{10}} = \sqrt{7+3} - \sqrt{7-3}$$

$$\sqrt{7-2\sqrt{10}} = \sqrt{10} - 2 \text{ Ans}$$

Art. 489. $1 + \sqrt{1+x} = 1 + \frac{x}{2} - \frac{x^2}{8} + \frac{x^3}{16} - \frac{5x^4}{128}$

$$\begin{array}{r} 2 + \frac{x}{2} \quad x + \frac{x^2}{4} \\ \hline 2 + x - \frac{x^2}{8} \quad - \frac{x^2}{8} \\ \hline \frac{x^2}{8} - \frac{x^3}{8} + \frac{x^4}{64} \\ \hline 2 + x - \frac{x^2}{4} + \frac{x^3}{16} \quad - \frac{x^3}{8} + \frac{x^4}{64} \\ \hline \frac{x^3}{8} - \frac{x^4}{64} \\ \hline \frac{x^3}{8} + \frac{x^4}{16} - \frac{x^5}{64} + \frac{x^6}{256} \\ \hline 1 + x - \frac{x^2}{4} + \frac{x^3}{8} - \frac{5x^4}{128} \quad \frac{5x^4}{128} + \frac{x^5}{64} - \frac{x^6}{256} \\ \hline \frac{5x^4}{128} + \frac{x^5}{64} - \frac{x^6}{256} \\ \hline \frac{5x^4}{128} \quad \text{Ans} \end{array}$$

Expand into a series $\frac{1+2x}{1-x-x^2}$

Assume $\frac{1+2x}{1-x-x^2} = A + Bx + Cx^2 + Dx^3 + \dots$
 $\frac{1+2x}{1-x-x^2} = \frac{A+Bx+Cx^2+Dx^3+\dots}{1-x-x^2}$
 $1+2x = (A+Bx+Cx^2+Dx^3+\dots)(1-x-x^2)$

$0 = (A-1) + (B-A-2x) + (C-B-A)x^2 + (D-C-B)x^3 + \dots$

$A-1=0$
 $A=1$
 $B-A-2=0$
 $B-1-2=0$

$B=1+2$

$\frac{x^2}{Cx^2+Bx^2-Ax^2}=0$
 $C-B-A=0$
 $C-B-1=0$

$\frac{1+2x}{1-x-x^2} = 1 + 3x + 4x^2 + 7x^3 + \dots$

Ans

$\frac{x^3}{Dx^3+Cx^3-Bx^3}=0$
 $D-C-B=0$
 $D-C-1=0$

4 Expand into series $\frac{d}{b-ax}$

$\frac{d}{b-ax} = \frac{d}{b} \frac{1}{1-\frac{ax}{b}} = \frac{d}{b} (A + Bx + Cx^2 + Dx^3 + \dots)$

$\frac{d}{b-ax} = \frac{d}{b} \frac{1}{1-\frac{ax}{b}} = \frac{d}{b} (A + Bx + Cx^2 + Dx^3 + \dots)$

$1 = (A + Bx + Cx^2 + Dx^3 + \dots)(1 - \frac{ax}{b})$
 $1 = A - \frac{aAx}{b} + Bx - \frac{aBax}{b} + Cx^2 - \frac{aCax^2}{b} + Dx^3 - \frac{aDax^3}{b} + \dots$

$0 = (A-1) + (B-\frac{aA}{b})x + (C-\frac{aB}{b})x^2 + (D-\frac{aC}{b})x^3 + \dots$

$A-1=0$

$A=1$
 $B-\frac{aA}{b}=0$
 $B-\frac{a}{b}=0$

$B=\frac{a}{b}$

$C-\frac{aB}{b}=0$
 $C-\frac{a^2}{b^2}=0$
 $C=\frac{a^2}{b^2}$

$D-\frac{aC}{b}=0$

$D=\frac{a^3}{b^3}$

$\frac{d}{b} \frac{1}{1-\frac{ax}{b}} = \frac{d}{b} (1 + \frac{ax}{b} + \frac{a^2x^2}{b^2} + \frac{a^3x^3}{b^3} + \dots)$

Answer

$$2 \left\{ \begin{array}{l} 24 : 3 :: 384 : 12 \\ 16 : 4 :: 4 : 1 \end{array} \right.$$

$$3 \left\{ \begin{array}{l} 24 : 4 :: 96 : 3 \\ 16 : 2 :: 2 : 1 \end{array} \right.$$

$$4 \left\{ \begin{array}{l} 84 : 7 :: 100 : 20 \\ 5 : 1 :: 12 : 20 \end{array} \right.$$

$$5 \left\{ \begin{array}{l} 84 : 12 :: 100 : 5 \\ 20 : 1 :: 7 : 5 \end{array} \right.$$

$$6 \left\{ \begin{array}{l} 2026 : 40 :: 6060 : 20 \\ 40 : 40 :: 20 : 6 \end{array} \right.$$

$$7 \left\{ \begin{array}{l} 200 : 22 = 6 :: 300 : 4 \\ 12 : 22 = 6 :: 5 : 4 \end{array} \right.$$

$$2 \cdot 2.5 \times 17.3 \times 123 \times 6 \times 10.25 : 2.5$$

$$1 \left\{ \begin{array}{l} 12 : 10 :: 24 : 120 \\ 48 : 120 \end{array} \right.$$

$$2 \left\{ \begin{array}{l} 456 : 18 :: 2500 : 28 \\ 50 : 28 \end{array} \right.$$

$$5 \left\{ \begin{array}{l} 12 : 50 \\ 108 : 100 :: 125 : 125 \\ 60 : 100 :: 500 : 500 \end{array} \right.$$

$$4 \left\{ \begin{array}{l} 3 : 1 :: 45 : 12 \\ 5 : 1 :: 4 : 12 \end{array} \right.$$

$$5 \left\{ \begin{array}{l} 240 : 12 :: 720 : 24 \\ 16 : 12 :: 12 : 24 \end{array} \right.$$

$$6 \left\{ \begin{array}{l} 16.5 : 125 : 80 \\ 1.5 : 780 : 177.27 \end{array} \right.$$

$$10.25 : 2.5 : 45 \times 346 \times 123 \times 8.2 \times 9 : 12$$

$$4 : 1 :: 4 : 1$$

$$8 \left\{ \begin{array}{l} 10 : 3 :: 3 : 10 \end{array} \right.$$

$$9 \left\{ \begin{array}{l} 200 : 80 :: 200 : 80 \\ 6 : 6 \end{array} \right.$$

$$10 \left\{ \begin{array}{l} 9 : 450 \end{array} \right.$$

$$11 \left\{ \begin{array}{l} 8 : 12.375 :: 1 : 15 \end{array} \right.$$

$$12 \left\{ \begin{array}{l} - \end{array} \right.$$

| | | | | | | |
|----|-----|-----|-----|----|----|----|
| 5 | 120 | 6 | 1-4 | 17 | 18 | 4 |
| 4 | | | 9 | | | 5 |
| 9 | 6 | 10 | 4 | 2 | 11 | 9 |
| | | | 5 | | | |
| 13 | 4 | 14 | 9 | 13 | 9 | 16 |
| | | | | | | |
| 17 | 4 | 18 | 7 | 19 | 4 | |
| | | | | | | |
| 20 | 2 | ans | | | | |

Infinite Series

5 Expand into a series $\frac{1-x}{1-2x-3x^2}$

$$\frac{1-x}{1-2x-3x^2} = A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots$$

$$\begin{array}{r} A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots \\ - (A + 2Bx + 3Cx^2 + 2Dx^3 + 3Ex^4 + \dots) \\ \hline -1 + x - 3Ax^2 - 3Bx^3 - 3Cx^4 - 3Dx^5 - 3Ex^6 \end{array}$$

$$0 = (A-1) + (B-2A)x + (C-3A)x^2 + (D-3B)x^3 + (E-3C)x^4 + \dots$$

$$\begin{array}{l} A-1=0 \\ B-2A=0 \\ C-3A=0 \\ D-3B=0 \\ E-3C=0 \end{array} \quad \begin{array}{l} B=2A \\ C=3A \\ D=6A \\ E=9A \end{array}$$

$$\frac{1-x}{1-2x-3x^2} = 1 + x + 5x^2 + 13x^3 + 41x^4 + \dots$$

6 Expand into a series $\frac{1}{1-x-x^2+x^3}$

$$\frac{1}{1-x-x^2+x^3} = A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots$$

$$\begin{array}{r} A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots \\ - (A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots) \\ \hline 1 - Ax - Bx^2 - Cx^3 - Dx^4 - Ex^5 - \dots \end{array}$$

$$\frac{1}{1-x-x^2+x^3} = 1 + x + 2x^2 + 2x^3 + 3x^4 + \dots$$

Expand into a series $\frac{a}{1-bx}$

$$\frac{a}{1-bx} = A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots$$

$$\frac{a}{1-bx} = a + abx + ab^2x^2 + ab^3x^3 + ab^4x^4 + \dots$$

8 Infinite Series

8 Expand $\frac{1-x}{1-5x+6x^2}$

$$\frac{1-x}{1-5x+6x^2} = A + Bx + Cx^2 + Dx^3 + Ex^4 \dots$$

$$1 - 5Ax - 5Bx^2 - 5Cx^3 - 5Dx^4 \dots$$

$$x + 6Ax^2 + 6Bx^3 + 6Cx^4 \dots$$

$$0 = (A-1) + (B-5A+x) + (Cx^2-5Bx^2+6Ax^2) \dots$$

$$A-1=0 \quad x/Bx-5Ax+x=0 \quad x^2/Cx^2-5Bx^2+6Ax^2=0$$

$$A=1 \quad B-5A+1=0 \quad C-5B+6A=0$$

$$B-5A=0 \quad C-5B+6A=0$$

$$B=5A-1 \quad C=5B-6A$$

$$\frac{1-x}{1-5x+6x^2} = 1 + 4x + 14x^2 \dots \text{Ans}$$

9. Expand $\frac{a+bx}{(1-dx)^2}$

$$\frac{a+bx}{(1-dx)^2} = A + Bx + Cx^2 + Dx^3 \dots$$

$$-2Adx - 2Bdx^2 - 2Cdx^3 \dots$$

$$dx + d^2x^2 \dots$$

$$0 = (A-a) + (B-2Ad-x) + (Cx^2-2Bdx^2+Ad^2x^2) \dots$$

$$A-a=0 \quad x/Bx-2Adx-bx=0 \quad x^2/Cx^2-2Bdx^2+Ad^2x^2=0$$

$$A=a \quad B-2Ad-b=0 \quad C-2Bd+Ad^2=0$$

$$B=2Ad+b \quad C=2Bd-Ad^2$$

$$\frac{a+bx}{(1-dx)^2} = a + (2ad+b)x + (4ad+2bd-ad^2)x^2 \dots \text{Ans}$$

10 Expand $\frac{1+x}{(1-x)^3}$

$$\frac{1+x}{(1-x)^3} = A + Bx + Cx^2 + Dx^3 \dots$$

$$-3Ax - 3Bx^2 - 3Cx^3 \dots$$

$$-x + x^2 \dots$$

$$0 = (A-1) + (B-3Ax-x) + (Cx^2-3Bx^2+3Ax^2) + (Dx^3-3Cx^3+3Bx^3) \dots$$

$$1-3x+3x^2-x^3 \quad Bx-3Ax-x=0 \quad x^2/Cx^2-3Bx^2+3Ax^2=0$$

$$A-1=0 \quad B-3A-1=0 \quad C-3B+3A=0$$

$$A=1 \quad B=3A+1 \quad C=3B-3A$$

$$x^3/Dx^3-3Cx^3+3Bx^3-Ax^3=0$$

$$D-3C+3B-A=0$$

$$D=3C-3B+A$$

$$\frac{1+x}{(1-x)^3} = 1 + 4x + 9x^2 + 16x^3 \dots$$

Ans

3 What is the sum of the infinite series
 $S = \frac{1 \cdot 3}{1 \cdot 1} = \frac{3 \times 1}{2} = \frac{3}{2}$ Ans $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \frac{1}{81} \text{ \&c}$

Art. 493. 4. What is the sum of the infinite series
 $\frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} + \frac{1}{3 \cdot 4 \cdot 5} + \frac{1}{4 \cdot 5 \cdot 6} \text{ \&c}$

$$S = \frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} \text{ \&c}$$

$$S - \frac{1}{2} = \frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \frac{1}{30} \text{ \&c}$$

$$\frac{1}{2} = \frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} + \frac{1}{3 \cdot 4 \cdot 5} + \frac{1}{4 \cdot 5 \cdot 6} \text{ \&c by subtraction.}$$

$$\text{or } \frac{1}{4} = \frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} + \frac{1}{3 \cdot 4 \cdot 5} + \frac{1}{4 \cdot 5 \cdot 6} \text{ \&c}$$

Ans

2 What is the sum of the infinite series
 $1 + 3x + 4x^2 + 4x^3 + 11x^4 + 18x^5 + 29x^6 \text{ \&c}$

Let $S = A + B + C + D + E \text{ \&c}$ & sup $m+n$ the relation

$$C = Bmx + Anx^2$$

$$D = Cmx + Bnx^2$$

$$E = Dmx + Cnx^2$$

$$S = A + B + (Bmx + Anx^2) + (Cmx + Bnx^2) + Dmx + Cnx^2$$

$$S = A + B + C \text{ \&c}$$

$$S - A = B + C + D \text{ \&c}$$

$$S = A + B + (Dmx + Anx^2) + Dnx^2$$

$$1 - mx - nx^2 \mid S - Smx - Dnx^2 = A + B - Anx$$

$$S = \frac{A+B-Anx}{1-mx-nx^2}$$

$$S = \frac{1+3x-x}{1-x-x^2} = \frac{1+2x}{1-x-x^2} \text{ Ans}$$

3 What is the sum of the infinite series
 $1 + x + 5x^2 + 13x^3 + 41x^4 + 121x^5 + 365x^6 \text{ \&c}$

Let $S = A + B + C + D \text{ \&c}$

$$C = Bmx + Bnx^2$$

$$D = Cmx + Bnx^2$$

$$S = A + B \text{ \&c}$$

$$S = A + B + (Dmx - Anx^2) + Dnx^2$$

$$S - A = B + C \text{ \&c} \mid 1 - mx \mid S - Smx \mid Dnx^2 = A + B - Anx$$

$$S = \frac{A+B-Anx}{1-mx-nx^2}$$

Infinite Series

$$C = Bm + An \times B = B^2 = B^2m + ABn$$

$$D = Bm + Bn \times A = AD = ABm + AB^2n$$

$$B^2 - AB^2D = (B^2m + ABn) - (ABm + AB^2n)$$

$$m = \frac{5 - 13 - 8}{1 - 5} = -2 \quad \text{--- } AB + B^2 \quad | \quad B^2m - ABm = B^2 - AD$$

$$m = \frac{B^2 - AD}{B^2 - AB}$$

$$C = Bm + An \times B$$

$$D = Bm + Bn \times A$$

$$C^2 = B^2m + ABn^2$$

$$B^2D = B^2m + B^2n^2$$

$$C^2 - B^2D = ABn^2 - B^2n^2$$

$$ABn^2 / (ABn^2 - B^2n^2) = C^2 - B^2D$$

$$n = \frac{C^2 - B^2D}{AB - B^2}$$

$$n = \frac{25 - 1 \times 13}{5 - 1} = \frac{12}{4} = 3 \quad AB - B^2$$

$$S = \frac{1 - x}{1 - 2x - 3x^2}$$

Ans

4 What is the sum of the infinite series
 $1 + 2x + 3x^2 + 4x^3 + 5x^4 + \dots$

Let $S = A + B + C + D$ the Sup. m + n the Relation

$$C = Bmx + Anx^2$$

$$D = Bmx + Bnx^2$$

$$S = C + D + (Bmx + Anx^2) + (Bmx + Bnx^2)$$

$$S = C + B$$

$$S - C = B$$

$$S = C + B + (Bmx + Anx^2) + (Bmx + Bnx^2)$$

$$1 - mx - nx^2 (S - Bmx - Bnx^2) = A + B - Anx$$

$$S = \frac{A + B - Anx}{1 - mx - nx^2}$$

$$m = \frac{DB - B^2}{C^2 - B^2} = \frac{4 \times 3 - 2 \times 5}{9 - 2 \times 4} = \frac{2}{1} = 2$$

$$n = \frac{C^2 - B^2}{C^2 - B^2} = \frac{3 \times 5 - 16}{9 - 2 \times 4} = -\frac{1}{1} = -1$$

$$S = \frac{1 + 2x - 2x^2}{1 - 2x + x^2} = \frac{1}{(1-x)^2} \quad \text{Ans}$$

Of Infinite Series

5 What is the sum of the infinite series
 $1 + 3x + 5x^2 + 7x^3 + 9x^4 + 11x^5 \dots$

Let $S = A + B + C + D \dots$ sup $m+n$ the relation

$$C = B \cdot m\alpha + A \cdot n\alpha^2$$

$$D = C \cdot m\alpha + B \cdot n\alpha^2$$

$$S = A + B + (B \cdot m\alpha + A \cdot n\alpha^2) + (C \cdot m\alpha + B \cdot n\alpha^2)$$

$$S = A + B + \dots$$

$$S - A = B + C + \dots$$

$$S = A + B + (S \cdot m\alpha - A \cdot m\alpha) + (S \cdot n\alpha^2)$$

$$1 - m\alpha - n\alpha^2 \mid S - S \cdot m\alpha - S \cdot n\alpha^2 = A + B - A \cdot m\alpha$$

$$S = \frac{A + B - A \cdot m\alpha}{1 - m\alpha - n\alpha^2}$$

$$m = \frac{D \cdot C - B \cdot E}{C \cdot C - B \cdot D} = \frac{7 \times 5 - 3 \times 9}{25 - 3 \times 7} = \frac{8}{4} = 2$$

$$n = \frac{C \cdot E - D \cdot D}{C \cdot C - B \cdot D} = \frac{5 \times 9 - 4 \times 7}{25 - 3 \times 7} = \frac{-11}{4} = -1$$

$$S = \frac{1 + 3x - 2x}{1 - 2x + x^2} = \frac{1+x}{(1-x)^2} \text{ Ans}$$

6 What is the sum of the infinite series
 $1 + 2x + 8x^2 + 28x^3 + 100x^4 \dots$

Let $S = A + B + C + D \dots$ sup $m+n$ the relation

$$C = B \cdot m\alpha + A \cdot n\alpha^2$$

$$D = C \cdot m\alpha + B \cdot n\alpha^2$$

$$S = A + B + (B \cdot m\alpha + A \cdot n\alpha^2) + (C \cdot m\alpha + B \cdot n\alpha^2)$$

$$S = A + B + \dots$$

$$S - A = B + C + \dots$$

$$S = A + B + (S \cdot m\alpha - A \cdot m\alpha) + (S \cdot n\alpha^2)$$

$$1 - m\alpha - n\alpha^2 \mid S - S \cdot m\alpha - S \cdot n\alpha^2 = A + B - A \cdot m\alpha$$

$$m = \frac{D \cdot C - B \cdot E}{C \cdot C - B \cdot D} = \frac{28 \times 8 - 2 \times 100}{64 - 2 \times 28} = \frac{24}{8} = 3$$

$$n = \frac{C \cdot E - D \cdot D}{C \cdot C - B \cdot D} = \frac{8 \times 100 - 28 \times 28}{64 - 2 \times 28} = \frac{16}{8} = 2$$

$$S = \frac{1 + 2x - 3x}{1 - 3x - 2x^2} = \frac{1-x}{1-5x-2x^2} \text{ Ans}$$

Continued Bk II

1 What is the sum of the infinite series

$$1 + 4x + 6x^2 + 11x^3 + 28x^4 + 63x^5 \dots$$

Let $S = A + B + C + D + E \dots$ be the sum of the series

$$D = Cma + Bna^2 + Axa^3$$

$$E = Dma + Cna^2 + Bxa^3$$

$$S = A + B + C + (Cma + Bna^2 + Axa^3) + (Dma + Cna^2 + Bxa^3)$$

$$S = A + B \dots$$

$$S - A = B + C \dots$$

$$S - A - B = C + D$$

$$S = A + B + C + (Dma - Ama - Bma) + (Dna^2 - Ana^2) + (Dxa^3 - Axa^3)$$

$$1 - ma - na^2 - xa^3 \mid S - Ama - Ana^2 - Axa^3 = A + B + C - Ama - Bma - Cma$$

$$S = \frac{A + B + C - Ama - Bma - Cma}{1 - ma - na^2 - xa^3} = \frac{1 + 4x + 6x^2 - 2x - 8x^2 + x^2}{1 - 2x + x^2 - 3x^3} = \frac{(1+x)^2 - 2x^2}{(1-x)^2 - 3x^3} \text{ Ans}$$

2 What is the sum of the infinite series

$$1 + x + 2x^2 + 2x^3 + 3x^4 + 3x^5 + 4x^6 + 4x^7 \dots$$

Let $S = A + B + C + D + E \dots$

$$D = Cma + Bna^2 + Axa^3$$

$$E = Dma + Cna^2 + Bxa^3$$

$$S = A + B + C + (Cma + Bna^2 + Axa^3) + (Dma + Cna^2 + Bxa^3)$$

$$S = A + B \dots$$

$$S - A = B + C \dots$$

$$S - A - B = C + D$$

$$S = A + B + C + (Dma - Ama - Bma) + (Dna^2 - Ana^2) + (Dxa^3 - Axa^3)$$

$$1 - ma - na^2 - xa^3 \mid S - Ama - Ana^2 - Axa^3 = A + B + C - Ama - Bma - Cma$$

$$S = \frac{A + B + C - Ama - Bma - Cma}{1 - ma - na^2 - xa^3} = \frac{1 + x + 2x^2 - x - x^2 - x^2}{1 - x - x^2 + x^3} = \frac{1}{1 - x - x^2 + x^3} \text{ Ans}$$

Infinite Series

Prob. 3

What is the 12th term of the series

| | | | | | | |
|----|----|-----|-----|-----|-----|---------|
| 2. | 6. | 12. | 20. | 30. | 40. | $a=2$ |
| 4. | 6. | 8. | 10. | | | $D'=4$ |
| | 2. | 2. | 2. | | | $D''=2$ |
| | | 0. | 0. | | | |

$$a + (n-1)D' + (n-1)\frac{n-2}{2}D''$$

$$2 + (12-1)4 + (12-1)\frac{12-2}{2} \times 2$$

$$2 + 44 + 110 = 156 \text{ Ans}$$

4 What is the 15th term of the series 1² 2² 3² 4² 5² 6² &c

| | | | | | | |
|----|----|----|-----|-----|-----|---------|
| 1. | 4. | 9. | 16. | 25. | 36. | $a=1$ |
| 3. | 5. | 7. | 9. | 11. | | $D'=3$ |
| | 2. | 2. | 2. | 2. | | $D''=2$ |

$$a + (n-1)D' + (n-1)\frac{n-2}{2}D''$$

$$1 + (15-1)3 + (15-1)\frac{15-2}{2} \times 2$$

$$1 + 42 + 182 = 225 \text{ Ans}$$

Art 493 Prob. 5 What is the sum of 20 terms of the series 1. 3. 6. 10. 15. &c

| | | | | |
|----|----|----|----|---------|
| 2. | 3. | 4. | 5. | $a=1$ |
| 1. | 1. | 1. | 1. | $D'=2$ |
| | | | | $D''=1$ |

$$na + n\frac{n-1}{2}D' + n\frac{n-1}{2} \times \frac{n-2}{3}D''$$

$$20 + 20 \times \frac{20-1}{2} \times 2 + 20 \times \frac{20-1}{2} \times \frac{20-2}{3} \times 1$$

$$20 + 380 + 1140 = 1540 \text{ Ans}$$

6 What is the sum of 12 terms of the series 1⁴ 2⁴ 3⁴ 4⁴ 5⁴ 6⁴ &c

| | | | | | | |
|-----|------|------|------|------|-------|------------|
| 1. | 16. | 81. | 256. | 625. | 1296. | $a=1$ |
| 15. | 65. | 175. | 369. | 671. | | $D'=15$ |
| 40. | 170. | 194. | 302. | | | $D''=50$ |
| 60. | 84. | 108. | | | | $D'''=60$ |
| | 24. | 24. | | | | $D''''=24$ |

$$na + n\frac{n-1}{2}D' + n\frac{n-1}{2} \times \frac{n-2}{3}D'' + n\frac{n-1}{2} \times \frac{n-2}{3} \times \frac{n-3}{4}D''' + n\frac{n-1}{2} \times \frac{n-2}{3} \times \frac{n-3}{4} \times \frac{n-4}{5}D''''$$

$$= 12 + 12 \times \frac{12-1}{2} \times 15 = 990$$

$$n\frac{n-1}{2} \times \frac{n-2}{3} D'' = 12 \times \frac{12-1}{2} \times \frac{12-2}{3} \times 50 = 11000$$

$$n\frac{n-1}{2} \times \frac{n-2}{3} \times \frac{n-3}{4} D''' = 12 \times \frac{12-1}{2} \times \frac{12-2}{3} \times \frac{12-3}{4} \times 60 = 29700$$

$$n\frac{n-1}{2} \times \frac{n-2}{3} \times \frac{n-3}{4} \times \frac{n-4}{5} D'''' = 12 \times \frac{12-1}{2} \times \frac{12-2}{3} \times \frac{12-3}{4} \times \frac{12-4}{5} \times 24 = 19008$$

$$= 19008$$

$$29700$$

$$11000$$

$$990$$

$$60698 \text{ Ans}$$

Equations By Wm. H. McMichael

Prob. 2

What are the roots of the equation

Sup 6

$$x^3 - 8x^2 + 4x + 48 = 0$$

$$216 - 288 + 24 + 48 = 0$$

$$\frac{24}{288} - 288 = 0$$

$$x - 6 \mid x^3 - 8x^2 + 4x + 48 \mid x^2 - 2x - 8$$

$$\begin{array}{r} x^3 - 8x^2 + 4x + 48 \\ - (x^3 - 6x^2) \\ \hline -2x^2 + 4x + 48 \\ - (-2x^2 + 4x) \\ \hline -8x + 48 \\ - (-8x + 48) \\ \hline 0 \end{array}$$

$$\begin{aligned} x^2 - 2x - 8 &= 0 \\ x^2 - 2x &= 8 \\ x^2 - 2x + 1 &= 9 \\ x - 1 &= \sqrt{9} = 3 \\ x &= 1 + 3 = 4 \end{aligned}$$

$$x + 2 \mid x^2 - 2x - 8 \mid x + 2$$

$$\begin{aligned} x + 2 &= 0 \\ x &= -2 \\ x &= 4 \\ x &= 6 \end{aligned} \text{ Ans}$$

3 What are the roots of the equation

Sup 1

$$x^3 - 16x^2 + 65x - 50 = 0$$

$$1 - 16 + 65 - 50 = 0$$

$$x - 1 \mid x^3 - 16x^2 + 65x - 50 \mid x^2 - 15x + 50$$

$$\begin{array}{r} x^3 - 16x^2 + 65x - 50 \\ - (x^3 - x^2) \\ \hline -15x^2 + 65x - 50 \\ - (-15x^2 + 15x) \\ \hline 50x - 50 \\ - (50x - 50) \\ \hline 0 \end{array}$$

$$\begin{aligned} x - 15x &= -50 \\ x^2 - 15x + \frac{225}{4} &= \frac{225}{4} - 50 = \frac{25}{4} \\ x - \frac{15}{2} &= \pm \sqrt{\frac{25}{4}} = \pm \frac{5}{2} \\ x &= \frac{15}{2} \pm \frac{5}{2} = 10 \end{aligned}$$

$$\begin{aligned} x &= 1 \\ x &= 5 \\ x &= 10 \end{aligned} \text{ Ans}$$

$$x - 10 \mid x^2 - 15x + 50 \mid x - 5 = 0$$

4 What are the roots of the equation

Prob 3

$$x^3 + 2x^2 - 33x = 90$$

$$216 + 72 - 198 - 90 = 0$$

$$\frac{12}{288} - 288 = 0$$

$$x - 6 \mid x^3 + 2x^2 - 33x + 90 \mid x^2 + 8x + 15$$

$$\begin{array}{r} x^3 + 2x^2 - 33x + 90 \\ - (x^3 - 6x^2) \\ \hline 8x^2 - 33x + 90 \\ - (8x^2 - 48x) \\ \hline 15x - 90 \\ - (15x - 90) \\ \hline 0 \end{array}$$

$$\begin{aligned} x^2 + 8x &= -15 \\ x^2 + 8x + 16 &= 16 - 15 = 1 \\ x + 4 &= \sqrt{1} = 1 \\ x &= -4 \pm 1 = -5 \end{aligned}$$

$$\begin{aligned} x + 3 &= 0 \\ x &= -3 \end{aligned}$$

$$\begin{aligned} x &= 6 \\ x &= -5 \\ x &= -3 \end{aligned} \text{ Ans}$$

5 What is a near value of the roots of the equation

$$x^3 + 9x^2 + 4x = 80 \text{ Sub } x = r + 3$$

$$\begin{aligned} x &= (r + 3)^3 = r^3 + 3r^2 \cdot 3 + 3r \cdot 3^2 + 3^3 \\ 9x^2 &= 9(r + 3)^2 = 9r^2 + 18r \cdot 3 + 9 \cdot 3^2 \\ 4x &= 4r + 4 \cdot 3 \end{aligned}$$

$$\begin{aligned} r^3 + 9r^2 + 4r + 3r^2 \cdot 3 + 18r \cdot 3 + 4 \cdot 3 &= 80 \\ 8r^3 + 18r^2 + 4r + 3r^2 \cdot 3 + 18r \cdot 3 + 4 \cdot 3 &= 80 - r^3 - 9r^2 - 4r \\ 8r^3 + 18r^2 + 4 &= 80 - r^3 - 9r^2 - 4r \end{aligned}$$

2.5 = number tried

$$\begin{aligned} 80 - 15.625 - 56.25 - 10 &= \\ 18.75 + 45 + 4 &= \\ -1.875 &= \\ 67.75 &= \end{aligned}$$

$$1.875 \mid 67.75 \mid 1.03$$

$$\begin{aligned} 2.5 &= \\ 2.47 &= \end{aligned}$$

Equations By Hand

$$\begin{array}{r} 80-14.068223-54.9081-9.88 \\ 18.3027+44.46+4 \end{array}$$

$$11.143677$$

$$66.7627)11.143677 \text{ } 1.02 \text{ near value}$$

$$2.47$$

$$\text{Ans } 2.49$$

6 What is a near value of one of the roots of the equation $x^3+x^2+x=100$ Sup 4.3

$$\text{Sub } x+3=x^3$$

$$x^3=(x+3)^3=x^3+3x^2+3x+3$$

$$x^2=2x+3$$

$$x=x+3$$

$$3x^2+2x+1=100-x^3-7x^2-7x-3$$

$$\text{only } 100-79.507-18.47-4.3=-2.277$$

$$55.47+12.9+1$$

$$(4.3)^3=69.37$$

$$-2.277-0.3$$

$$4.27 \text{ near value}$$

2 What is a near value of one of the roots of the equation $x^3+10x^2+5x=2600$ Sup 11.01

$$x^3=(x+3)^3=x^3+3x^2+3x+3$$

$$10x^2=10x^2+20x+10$$

$$5x=5x+5$$

$$x^3+3x^2+10x^2+20x+5x+5=2600$$

$$3x^2+20x+5=2600-x^3-10x^2-5x$$

$$3x^2+20x+5=2600-x^3-10x^2-5x$$

$$2600-1334.633301-1212.2010-55.05$$

$$363.6603+220.20+5$$

$$225.20$$

$$588.8603-1884.3010-1103$$

$$1766.5809$$

$$-1034.633301$$

$$-1212.2010$$

$$-55.05$$

$$-2601.884301$$

$$2600$$

$$-1.884301$$

$$11.01$$

$$11.007 \text{ near value}$$

$$\text{Ans}$$

What are the roots of the equation $x^3+x^2-11x=12$

$$\text{Sup } 3$$

$$9+18-33-12=0$$

$$4) -4) = 0$$

$$x^2+5x=-4$$

$$x^2+5x+\frac{25}{4}=\frac{25}{4}-4=\frac{9}{4}$$

$$x+\frac{5}{2}=\sqrt{\frac{9}{4}}=\frac{3}{2}$$

$$x=-\frac{5}{2}-\frac{3}{2}=-4 \text{ or } -1$$

$$x=3$$

$$x=-4$$

$$x=-1$$

$$\text{Ans}$$

Prob 4 What are the roots of the equation
 Sup 3

$$x^4 + 4x^3 - 7x^2 - 34x = 24$$

$$81 + 108 - 63 - 102 - 24 = 0$$

$$\begin{array}{r} 81 \\ 189 \\ \hline \end{array} \quad \begin{array}{r} 63 \\ -24 \\ \hline 189 = 0 \end{array}$$

$$x - 3 \mid x^4 + 4x^3 - 7x^2 - 34x - 24 = 0 \quad x^3 + 7x^2 + 14x + 8 \quad \text{Sup} - 4$$

$$\begin{array}{r} x^4 \\ \underline{3x^3} \\ 7x^3 - 7x^2 \\ \underline{7x^3 - 21x^2} \\ 14x^2 - 34x \\ \underline{14x^2 - 42x} \\ 8x - 24 \end{array} \quad \begin{array}{r} x^3 + 7x^2 + 14x + 8 \\ \underline{-64 + 112 - 56 + 8 = 0} \\ 8 - 64 \\ \hline 120 - 120 = 0 \end{array}$$

$$x^2 + 3x = -2$$

$$x^2 + 3x + \frac{9}{4} = \frac{9}{4} - 2 = \frac{1}{4}$$

$$x + \frac{3}{2} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

$$x = -\frac{3}{2} \pm \frac{1}{2} = -2 \text{ or } -1$$

$$\begin{array}{r} 8x - 24 \\ \underline{8x - 24} \\ 0 \end{array} \quad \begin{array}{r} x + 4 \mid x^3 + 7x^2 + 14x + 8 \mid x^2 + 3x + 2 \\ \underline{x^3 + 4x^2} \\ 3x^2 + 14x + 8 \\ \underline{3x^2 + 9x} \\ 5x + 8 \\ \underline{5x + 10} \\ -2 \end{array}$$

$$\begin{array}{r} 3x^2 + 14x \\ \underline{3x^2 + 9x} \\ 5x + 8 \\ \underline{5x + 10} \\ -2 \end{array}$$

$$\begin{array}{r} 2x + 8 \\ \underline{2x + 8} \\ 0 \end{array}$$

$$\begin{array}{l} x = 3 \\ x = -4 \\ x = -2 \\ x = -1 \end{array} \quad \text{Ans}$$

8

Miscellaneous Questions Feb 23rd 1845

Two sides of a triangle are 20 and 40 perches respectively required the third side so that the content may be just an acre Ans 23.099 or 58.836 P

$$\frac{160}{20} = 8$$

$$\sqrt{20^2 - 8^2} = \sqrt{336} = 18.33$$

$$40 - 18.33 = 21.66$$

$$\frac{11.88}{21.66}$$

$$\frac{12.996}{21.66}$$

$$\frac{21.66}{21.66}$$

$$\frac{43.32}{21.66}$$

$$\frac{46.91556}{21.66}$$

$$+ 64.44444$$

$$533.33333 \times 23.09$$

$$43 \frac{1}{2}$$

$$44 \frac{1}{2}$$

$$4609 \frac{1}{2}$$

$$44481$$

$$+$$

$$\frac{40}{18.33} \sqrt{58.3348}$$

$$\frac{58.33}{58.33}$$

$$\frac{17489}{17489}$$

$$\frac{46664}{17489}$$

$$\frac{29165}{17489}$$

$$\frac{34023889}{17489}$$

$$+ 64$$

$$\frac{3466.3889}{17489}$$

$$25$$

$$108 \frac{466}{864}$$

$$1168 \frac{10238}{9344}$$

$$11767 \frac{89489}{82369}$$

$$+$$

3rd Qⁿ 110 Acres of Statute measure in which the pole is 3 1/2 yds how many cheshire Acres where the customary pole is 6 yds and how many of Ireland where the pole in use is 7 yds Ans 94.41 R 94 P Cheshire 67 3 25

$$\frac{110}{3.5} = 31.42857$$

$$\frac{110}{6} = 18.33333$$

$$\frac{110}{7} = 15.71428$$

$$\frac{110}{8} = 13.75$$

$$\frac{110}{9} = 12.22222$$

$$\frac{110}{10} = 11$$

$$\frac{110}{11} = 10$$

$$\frac{110}{12} = 9.16666$$

$$\frac{110}{13} = 8.46153$$

$$\frac{110}{14} = 7.85714$$

$$\frac{110}{15} = 7.33333$$

$$\frac{110}{16} = 6.875$$

$$\frac{110}{17} = 6.47058$$

$$\frac{110}{18} = 6.11111$$

4th Qⁿ The ellipse in Grosvenor Square London measures 840 links the longer way and 612 the shorter within the rails now the wall being 11 in. thick it is required to find what quantity of ground it enclosed and how much it stands on Enclaves 4.426 P 1760 square ft

Ans 4.426 P 1760 square ft

$$\frac{14}{28} = \frac{1}{2}$$

$$840 \times 7.92 = 6652.80 = 554.4 \text{ longer diameter}$$

$$612 \times 7.92 = 4847.04 = 403.92 \text{ less}$$

$$554.4 \times 403.92 \times .7854 = 175877.14$$

$$556.733 \times 406.253 \times .7854 = 177637.41$$

$$554.4 + \frac{1}{3} = 556.733$$

$$403.92 + \frac{1}{3} = 406.253$$

$$406.253 - 6 = 400.253$$

5 Required the dimensions of an elliptical acre 100 ft. the greater and less diameters in the ratio of 3 to 2 Ans 174 ft. 4 in.

$$174 \times 174 \times .7854 = 23534.97$$

$$23534.97 \div 174 = 135.25$$

$$3:2:17.4$$

6 Three Sides of a triangular field containing 6.812.10 are in the ratio of the three numbers 9. 8. 6. respectively required the Sides. Ans 59.029. 52.44. and 38.000

$$\frac{9}{11.3} = \frac{8}{10.5} = \frac{6}{5.5}$$

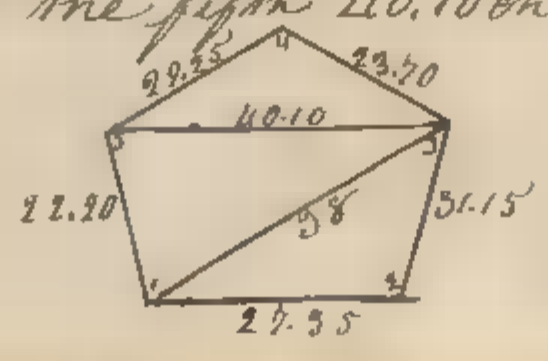
$$11.3 \times 10.5 \times 5.5 \times .7854 = 23534.97$$

$$8:4:52.44$$

$$8:6:52.44$$

$$23534.97 \div 174 = 135.25$$

13 On a pentangular field beginning with the South Side and measuring round towards the east the first or South Side is 27.35ch the Second 31.15ch the Third 23.70ch the 4th 29.25ch and the 5th 27.20ch; also the diagonal from the first angle to the 3rd is 38ch and that from the third to the fifth 40.10ch Required the area of the field. Ans 11742.39 P



| | | |
|---|---|--|
| $\begin{array}{r} 27.55 \\ 31.15 \\ 38 \\ \hline 2 \overline{196.50} \text{ Sum} \\ \text{half sum } 48.25 = \\ \text{Rem } \left\{ \begin{array}{l} 20.90 = \\ 17.10 = \\ 10.25 = \end{array} \right. \end{array}$ | $\begin{array}{r} 40.10 \\ 23.70 \\ 29.25 \\ \hline 2 \overline{193.05} \\ 46.525 = \\ 6.425 = \\ 22.825 = \\ 14.275 = \end{array}$ | $\begin{array}{r} 22.20 \\ 38.00 \\ 40.10 \\ \hline 2 \overline{100.30} \\ 50.15 = \\ 27.95 = \\ 12.15 = \\ 10.05 = \end{array}$ |
| $\begin{array}{r} 10 \overline{1420.4} = \\ 142 \quad -04 \\ \quad \quad 4 \\ \quad \quad \hline \quad \quad 16 \\ \quad \quad \quad 40 \\ \quad \quad \quad \hline \quad \quad 06.40 \end{array}$ | $\begin{array}{r} 2 \overline{1524757} \\ 2.82568 \\ 34 = 1 = 11 \\ 43 = 0 = 6 \\ 41 = 1 = 19 \\ \hline 117 = 2 = 36 \text{ Ans} \end{array}$ | $\begin{array}{r} 10 \overline{1413.7} \\ 141 \quad -37 \\ \quad \quad 4 \\ \quad \quad \hline \quad \quad 148 \\ \quad \quad \quad 40 \\ \quad \quad \quad \hline \quad \quad 019.20 \end{array}$ |

8) Required the dimensions of an oblong garden containing 8 Acres and bounded by 104 Poles of Pale fence

$\sqrt{26480}$ $\begin{array}{r} 4 \overline{) 104} \\ 26 \end{array}$ $\begin{array}{r} 166 \\ \hline \end{array}$ And 40 P by 12

$$\sqrt{26 \overline{) 480}} = 40 \text{ by } 12$$

(10) A gentleman has a garden 100 ft long and 80 broad and a gravel walk is to be made of equal width half round it. What must be the width of the walk so that may take up just $\frac{1}{4}$ of the ground. Ans 11.8975 ft

$$\begin{array}{r}
 1100 \\
 3000 \\
 \hline
 404000 \\
 1000 \\
 100 \\
 \hline
 20100728.102
 \end{array}$$

11. L. Persen had a garden 100 feet long and 80 broad
and a gravel walk. A person has a circular pond that
is 50 ft in diameter and wishes a walk of equal width
made round it within the fence requires the width of the S.
that it may occupy a fifth part of the ground and 3.518 ft

$$\begin{array}{r}
 150.1501.7554 - 126.218000 \\
 \underline{23.9321} \\
 126.918000
 \end{array}$$

12 From a point within a triangular field the sides of which were equally distant I measured the distances to the three angles and found them 12, 10 and 8 in, respectively. Required the area. Ans 120 sq. ft. 2.5

$$\begin{aligned}
 &12.5 - \text{arithmetic log} \sin 47.48 = \\
 &7.5 = \underline{\hspace{1cm}} \quad 113.8 = \\
 &2 \overline{130} \quad 13.5 = \\
 &\text{help sum } 1.5 = 1.14609 \quad 16.92 \\
 &\text{diff } 5 = 1.69893 \quad \text{Area } 21247.9 = \\
 &46.8.90309 \quad \text{Area } 9.12494 \quad \text{Area } 16.92 = \\
 &2 \overline{119.90309} \quad 16.92 = \\
 &\text{cos } 2634' = 4.95754 \quad \text{Area } 16.92 = \\
 &53.8' \quad \text{Area } 16.92 = \\
 &\quad \quad \quad \text{Area } 16.92 = \\
 &\quad \quad \quad \text{Area } 16.92 =
 \end{aligned}$$

$$\begin{aligned}
 12.5 + 7.5 &= 20 \\
 12.5 - 7.5 &= 5 \\
 \tan 33.26 &= \\
 \tan 9.22 &=
 \end{aligned}$$

$$\begin{aligned}
 53.8 \\
 60 \\
 113.8 \\
 180 \\
 3168.52' \\
 33.28'
 \end{aligned}$$

$$\begin{aligned}
 33.26' \\
 9.22 \\
 42.48
 \end{aligned}$$

$$\begin{aligned}
 26.34 \\
 9.22 \\
 35.56
 \end{aligned}$$

14 It is required to lay out 12 acres of land in a triangular form so that the length of one side may be 100 rods and the lengths of the other sides in the ratio of 2 to 3 What must be the lengths of those sides

$$\begin{aligned}
 302 - 5 : 15 : 8 = 45 = 9 \\
 76 - 3 : 9 : 6 = 34 = 18 \\
 \sqrt{18^2 + 6^2} = 16.461 \quad 76.461 \\
 10039
 \end{aligned}$$

$$\begin{aligned}
 \sqrt{1005^2 + 6^2} &= 11.68 \text{ ch} \\
 3 : 2 : 11.68 \text{ ch} \\
 3 \overline{25.3742} \\
 7.7811
 \end{aligned}$$

$$\begin{aligned}
 24 \\
 16.461 \\
 45.961 \\
 \sqrt{45.96^2 + 6^2} &= 44.37 \text{ ch}
 \end{aligned}$$

$$\begin{aligned}
 3 : 2 : 44.3789 \\
 3 \overline{88.7560} \\
 29.5853 \text{ ch}
 \end{aligned}$$

15 It is required to lay out 5 acres of ground in a triangular form so to be bounded by 100 rods of fence the length of one side is to be 50 rods What must be the lengths of the other sides

$$\begin{aligned}
 \text{Sides } 50 \\
 100 \cdot 85 : 85 = 81 \\
 3 \overline{50} \\
 30 \\
 16 \\
 32 \\
 47.25 = \\
 32 \\
 90 = \\
 \tan 34.7'
 \end{aligned}$$

$$\begin{aligned}
 160 \\
 50 \overline{1800} \quad 90^\circ = \\
 16 \quad \text{Area } 34.7 = \\
 47.25 = \\
 57.07 = \\
 50 = \\
 85 = \\
 \sin 34.7 = \\
 \sin 72.28
 \end{aligned}$$

$$\begin{aligned}
 \text{Area } 30.3785 \text{ and } 31.6215 \\
 34.7' \\
 47.25 \\
 106.35 \\
 180 \\
 73.25' \\
 \sin 73.25 = \\
 34.07 = \\
 57.07 = \\
 \text{Ans } 33.39 +
 \end{aligned}$$

16 The area of a rectangular field is 450 and the length of the diagonal 50 rods required the sides Ans 30 & 40 rods

$$\begin{aligned}
 450 \\
 30 \\
 40 \\
 1200 = 24 \\
 50
 \end{aligned}$$

$$\begin{aligned}
 250 \\
 25 \\
 \sqrt{25^2 - 24^2} &= 7 \\
 25 - 7 &= 18
 \end{aligned}$$

$$\begin{aligned}
 \sqrt{18^2 + 24^2} &= \sqrt{900} = 30 \\
 \sqrt{50^2 - 30^2} &= \sqrt{1600} = 40
 \end{aligned}$$

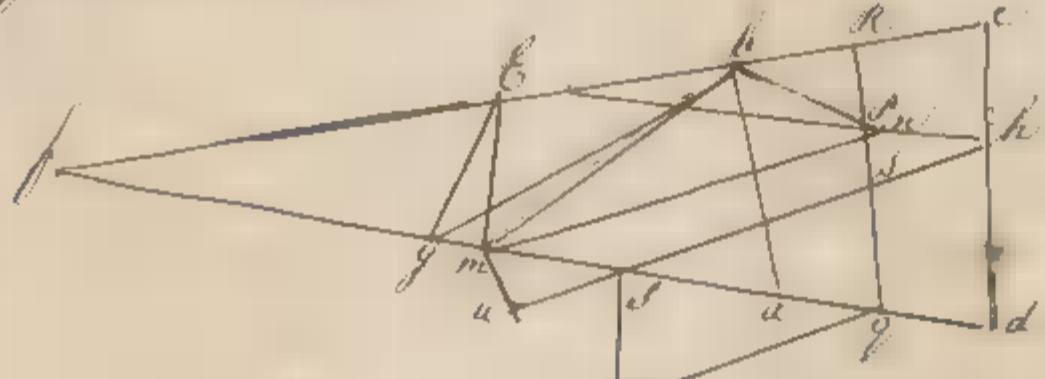
178

In a rectangular tract of land containing 588
30 80 the difference of the lengths of the sides is just
equal to the difference of the lengths of the longer side
and the diagonal hence the sides are required

Square 4 sides $40 \overline{) 180}$
 Triangle 3 do. $4 \overline{) 13.2}$
 $3 : 588 :: 4$
 $3 \overline{) 2352}$
 $784 \overline{) 2352}$
 $48 \overline{) 384}$

Ans. 21 & 28 ch.
 $4 : 588 :: 3$
 $4 \overline{) 1764}$
 $441 \overline{) 1764}$
 $41 \overline{) 44}$

18 The boundaries of a tract of land are as follows 1st
 11th 15.20 ch; 2nd N 40th E 20.43 ch 3rd S 6th E 22.49 ch 4th N 86th W
 18 ch to the place of beginning within the tract there is
 a Spring the bearing and distance of which from the
 2nd corner is S 75th E 7.90 ch. it is required to cut off 10 A
 from the west side of this tract by a straight line
 running through the Spring what must be the distance
 of the division line from the first corner measured
 on the south side



S 23th
 3103 30
 7.90
 11.452
 S 23th
 3111 30
 7.90
 4.031
 S 23th
 322 30
 13.20
 37.10
 S 23th
 384 30
 13.20
 38.72
 33.07 ar. ac
 19.36
 37.10
 21.72
 33.07 ar. ac
 S 23th
 R 40th
 Area 100
 7.439
 28.46 = 509 1.46123
 6.356 = 509 8.1664
 13.898 = 1.14293

fb be = 33.07
 24 ap = 18.56
 th bp = 18.008
 pm mi ep = 18.008
 fh = bp = 11.45
 hq bh = 18.008
 hq hi = 21.64
 hq hi = 6.856
 154 30 - 23 - 111
 ag = bh - bp - pm + mi + iq - fa
 21.72
 7.739
 13.898
 43.357
 33.72
 ag 4.637 Ans

11.25
 E 23th
 6.845
 a 7.25
 6.145
 2.115
 Sum = 11.45
 ab = 18.70
 bc = 20.43
 cd = 22.49
 ad = 18.00
 cp = 11.45
 bc = 4.031
 Bp = 37.10
 ap = 38.72
 fi = 33.07
 hq = 19.36
 pm = 21.72
 mi = 18
 Area of square etc
 mi = 7.439
 ph = 18.008
 hi = 11.45
 hq = 13.898
 ag = 4.637

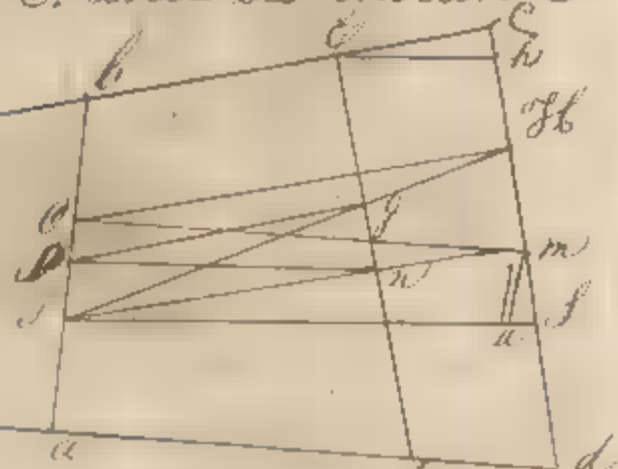
$145 \frac{1}{2}$
 23
 $168 \frac{1}{2}$
 130
 $11 \frac{1}{2}$

21.72
 7.739
 28.45
 11.45
 18.00

[Handwritten signature]

19. 1.

The boundaries of a quadrilateral tract of land are as follow: 1st $N 35^{\circ} E$ 25ch and 2nd $N 75^{\circ} E$ 30.50ch 3rd $S 35^{\circ} E$ 46.49ch and 4th $S 66^{\circ} W$ 48.64ch to the place of beginning. This tract is to be divided into four equal parts by two straight lines one of which is to run parallel to the 3rd side required the distance of the parallel division line from the first corner, measured on the 1st side; also the bearing of the other division line and its distance from the same corner measured on the 1st side
Ans. Distance of the parallel division line from the 1st corner 32.50ch the bearing of the other $S 88^{\circ} 22' E$ and its distance from the same corner 6 chains



$S 58^{\circ} 15'$
of 22.503 at co
 $S 63^{\circ}$
 $S 78^{\circ} 30'$
 $S 139^{\circ} 45'$
at 133
64th term 382.282
cd 21.61.3201
2/25.44.6071
7272.5010 = 35.67
 $S 58^{\circ} 15'$
 $S 78^{\circ} 30'$
10.82
17.14
 $S 58^{\circ} 15'$
 $S 63^{\circ}$
17.14
18.57
 $S 78^{\circ} 30'$ at co
 $S 63^{\circ}$
 $S 139^{\circ} 45'$
 $S 78^{\circ} 30'$
60 30.503
64th term 645.18
ad 2464.1296
2/5139.3096
om 17569.6548 = 39.62
 $S 58^{\circ} 15'$ at co
 $S 63^{\circ}$
10.02
14.24
 $S 78^{\circ} 30'$ at co
 $S 63^{\circ}$
 $S 139^{\circ} 45'$
 $S 78^{\circ} 30'$
66 14.93
66 14.93
64th term 161.79
ap 1056.25
1/1218.04 = 24.68

$S 58^{\circ} 15'$
7.82
11.19
14.74: 24.48 :: 3.15-5.20
 $S 63^{\circ}$
 $S 78^{\circ} 30'$
8.33
9.18
 $S 63^{\circ}$
 $S 78^{\circ} 30'$
8.33
9.18
48.45: 9.18 :: 38.62 = 8
62.63
28.27
tan 58.30
tan 26.23
14.93
14.93
66 15 Bearing of II
 $S 88^{\circ} 22' E$ 336
and 10/32.50
1.16588 22' E
29.6

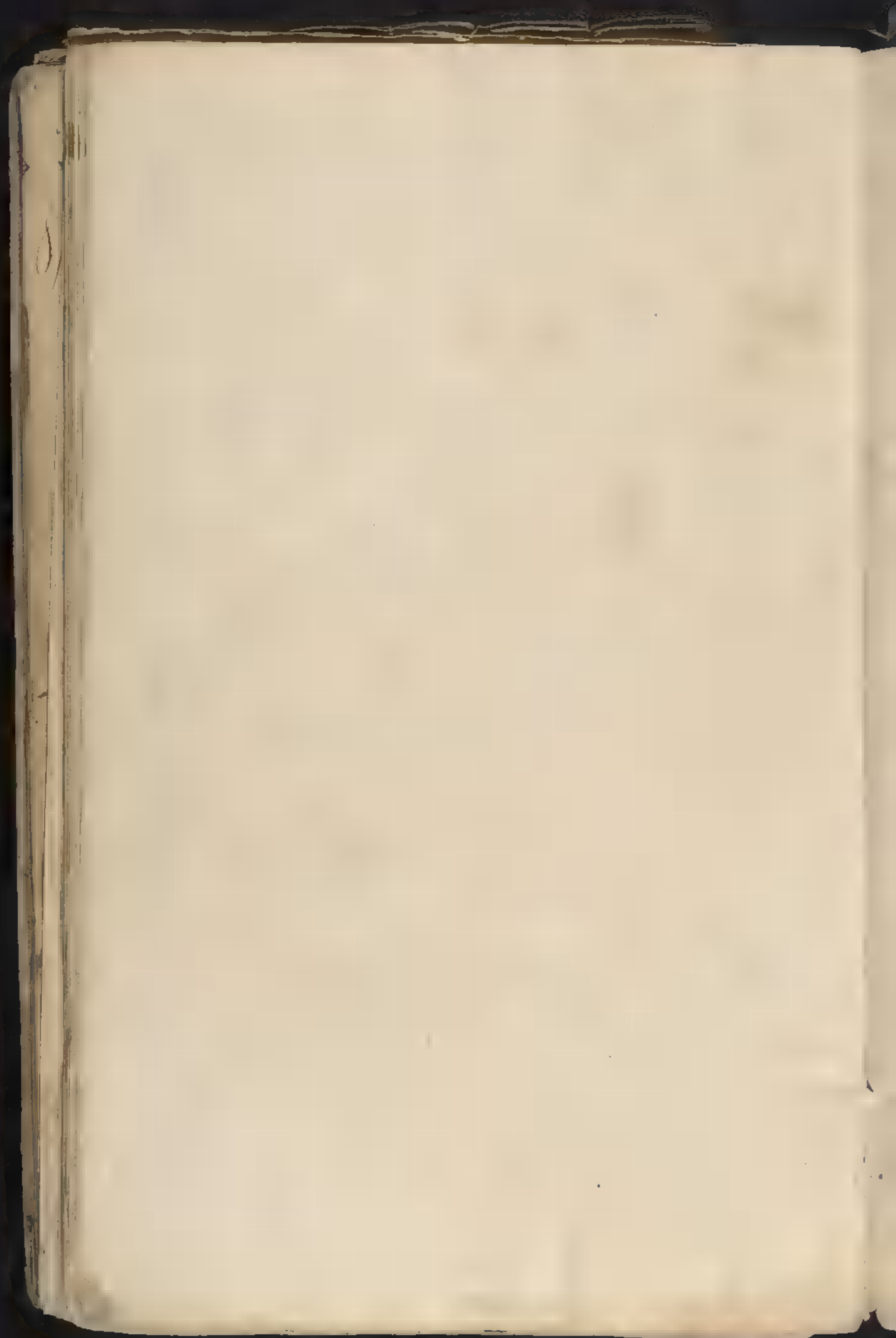
c 48.45
d 62.50
a 48.30
b 139.45
af 23.50
bc 30.50
cd 46.49
ad 118.62
ef 35.67
fd 14.14
af 32.50
ef 18.57
fe 14.93
om 39.62
ao 14.24
pn 24.68
ap 11.19
fp 5.20
fo 8.35
op 3.15
ml 9.18
ul 5.33
el 45.45
mk 8
fh 14.18
as 6

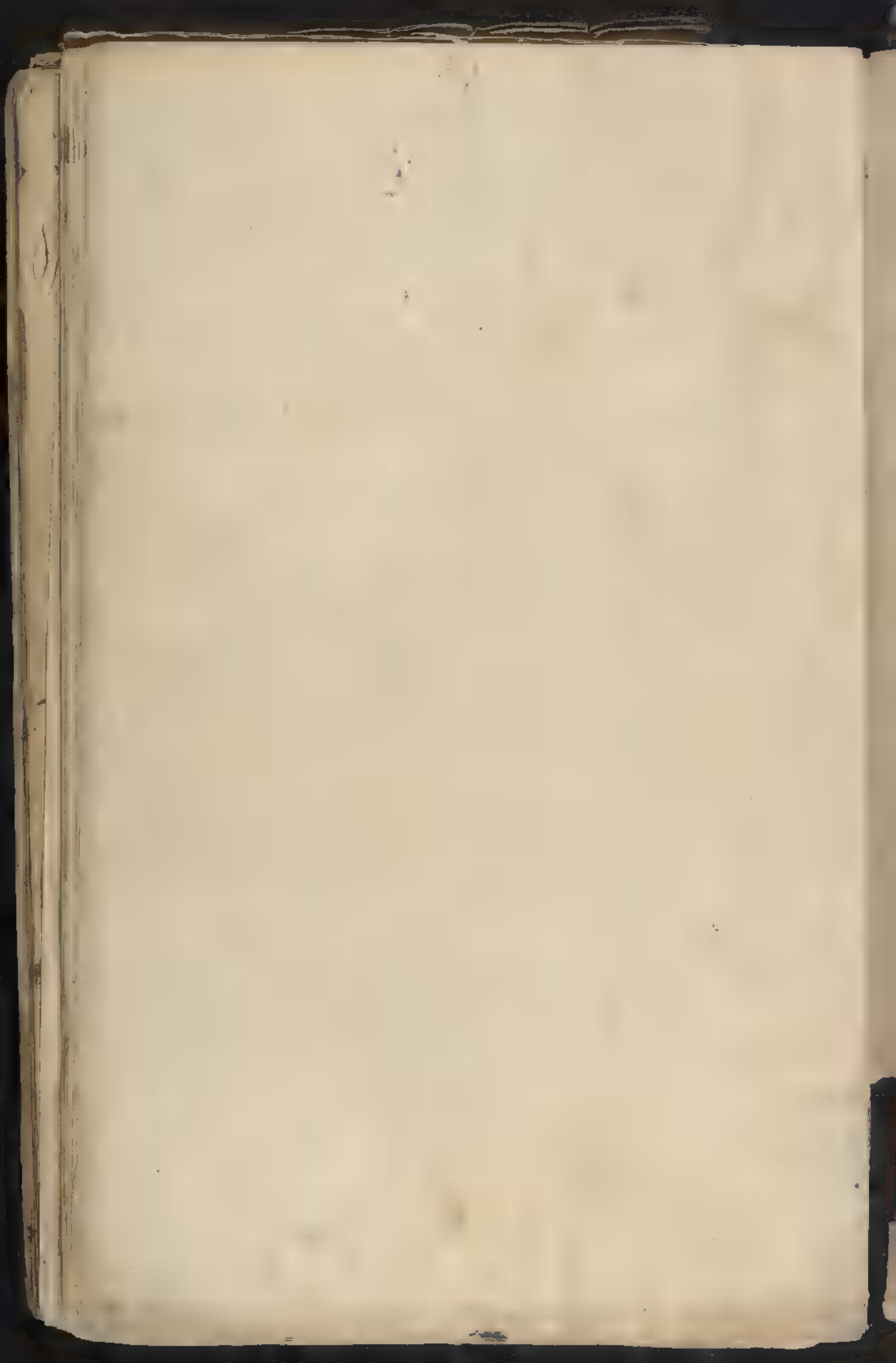
cd ef 10.82
ad fd 32.50
bc af 14.93
ad om 16.02
af pn 9.82
ao ap 3.15
om pn 14.94
ap fp 5.99
fp fo 8.35
ul om 45.45
mk lg 14.18
li lh 62.63
li lh 28.27
ao fo 6

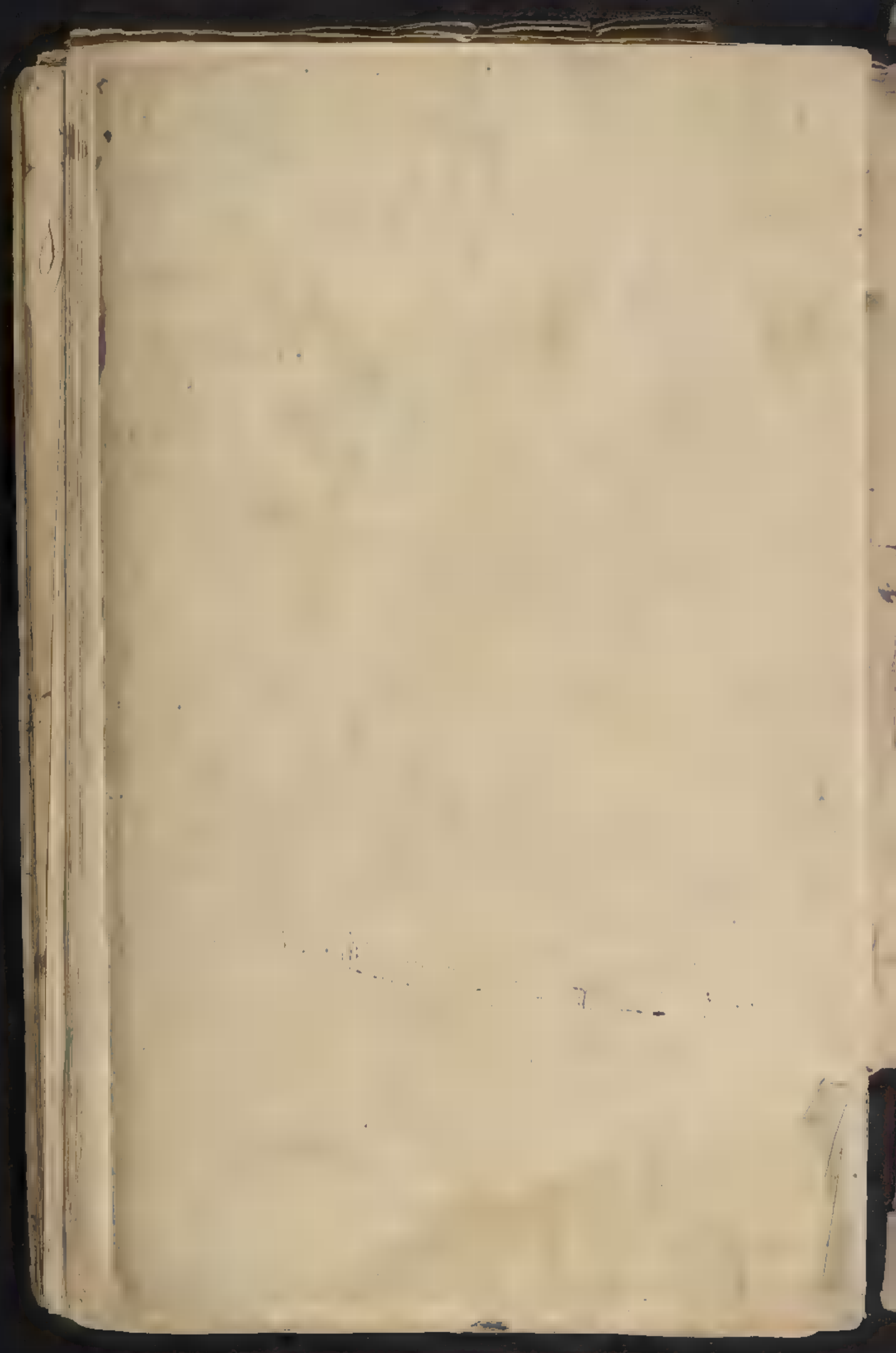
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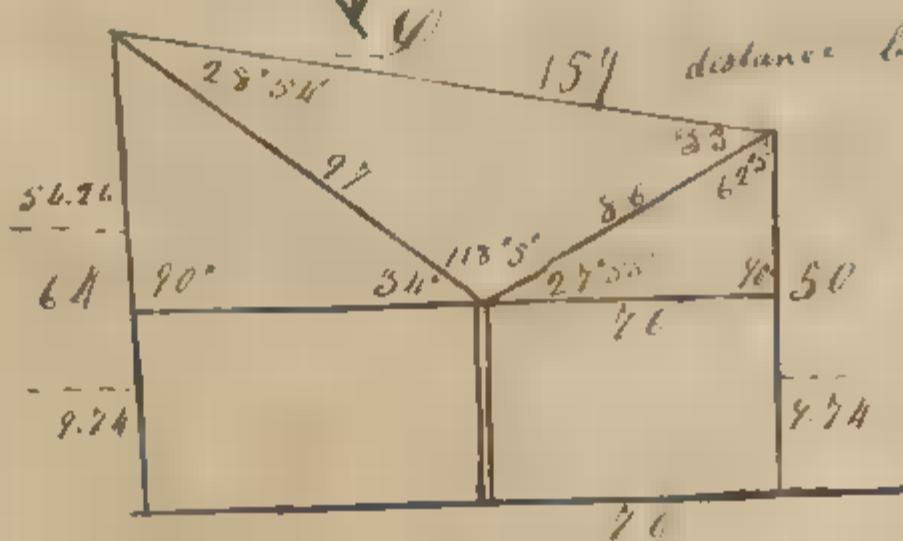
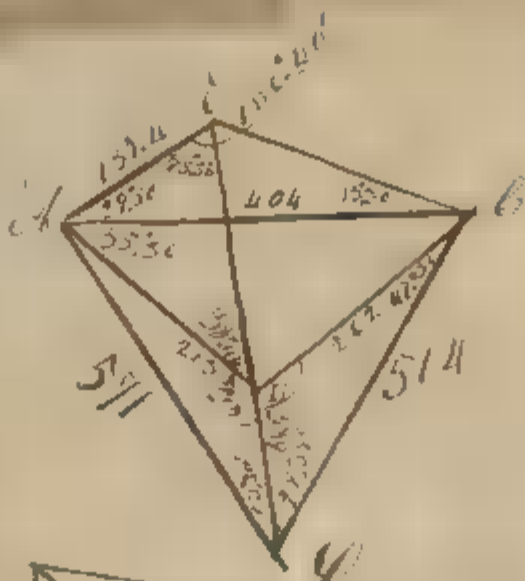


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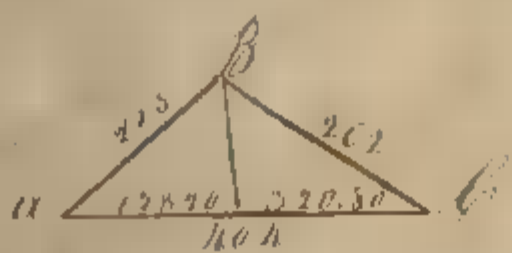






distance between the tops of the columns

$$\begin{array}{r}
 136.40' \\
 15.30' = \\
 110.4 \\
 \hline
 151.10' \\
 151.10' = 110.4
 \end{array}$$



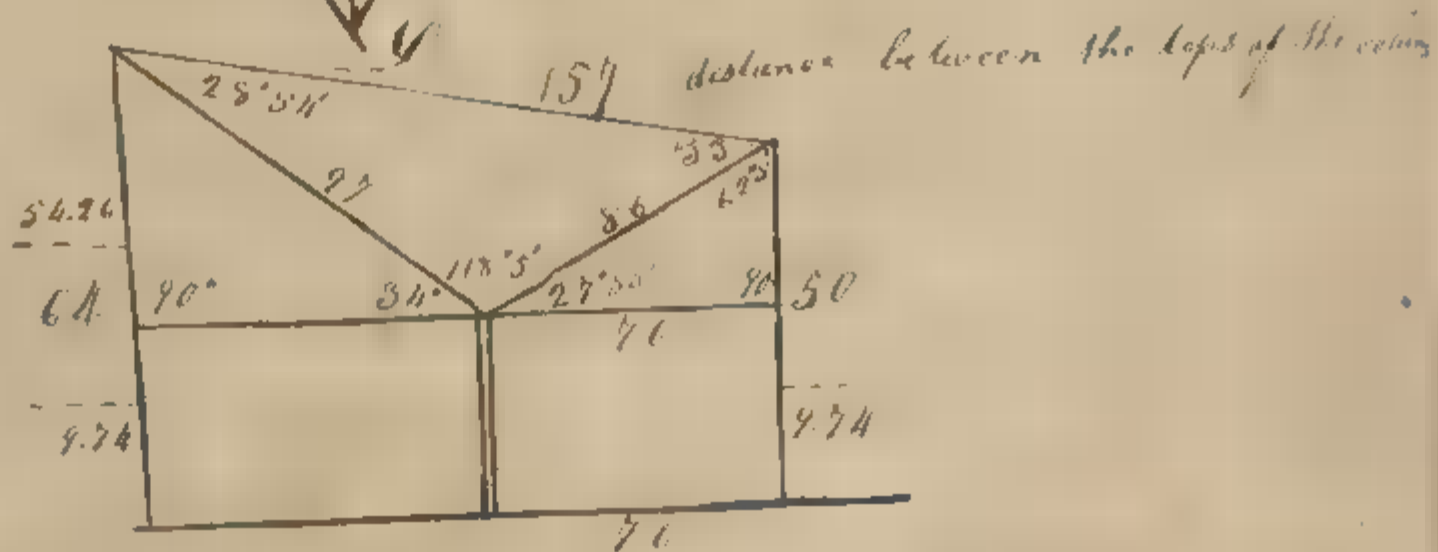
$$\begin{array}{r}
 10.1 = \\
 4.5 = \\
 11.9 = \\
 275.16 \text{ diff of segments} \\
 73.80 \\
 20.2 \\
 \hline
 150.80 \text{ height} \\
 175.90
 \end{array}$$

$$\begin{array}{r}
 21.5 = \\
 175.70 = \\
 90' = \\
 54.24 \\
 90 \\
 \hline
 55.36 \text{ Angle A} \\
 620.4 = \\
 75.6 = \\
 \text{tan } 57.14' = \\
 18.36 \\
 \hline
 180^\circ \\
 38.44 \\
 \hline
 141.46 \text{ angle A B D}
 \end{array}$$

$$\begin{array}{r}
 86 = \\
 76 = \\
 90' = \\
 \hline
 62.5' \text{ angle} \\
 90' = \\
 27.55' = \\
 86 = \\
 \hline
 110.20 \\
 50 \\
 \hline
 40.20 \\
 9.74 \\
 \hline
 97 = \\
 54.76 = \\
 90' = \\
 34' \text{ angle} \\
 \hline
 84' \\
 27.55 \\
 \hline
 61.55 \\
 180 \\
 \hline
 118.05' \\
 \hline
 183' = \\
 11 = \\
 \text{tan } 30.57' \\
 \text{tan } 2' 3' \\
 2161.55 \\
 30.57 \\
 2.03 \\
 \hline
 28.54' \\
 55 = \\
 118.05 = \\
 97 = \\
 157.1
 \end{array}$$

So

A man may deceive his neighbour
A man may deceive his neighbour
A man may deceive his neighbour
A man may deceive his neighbour

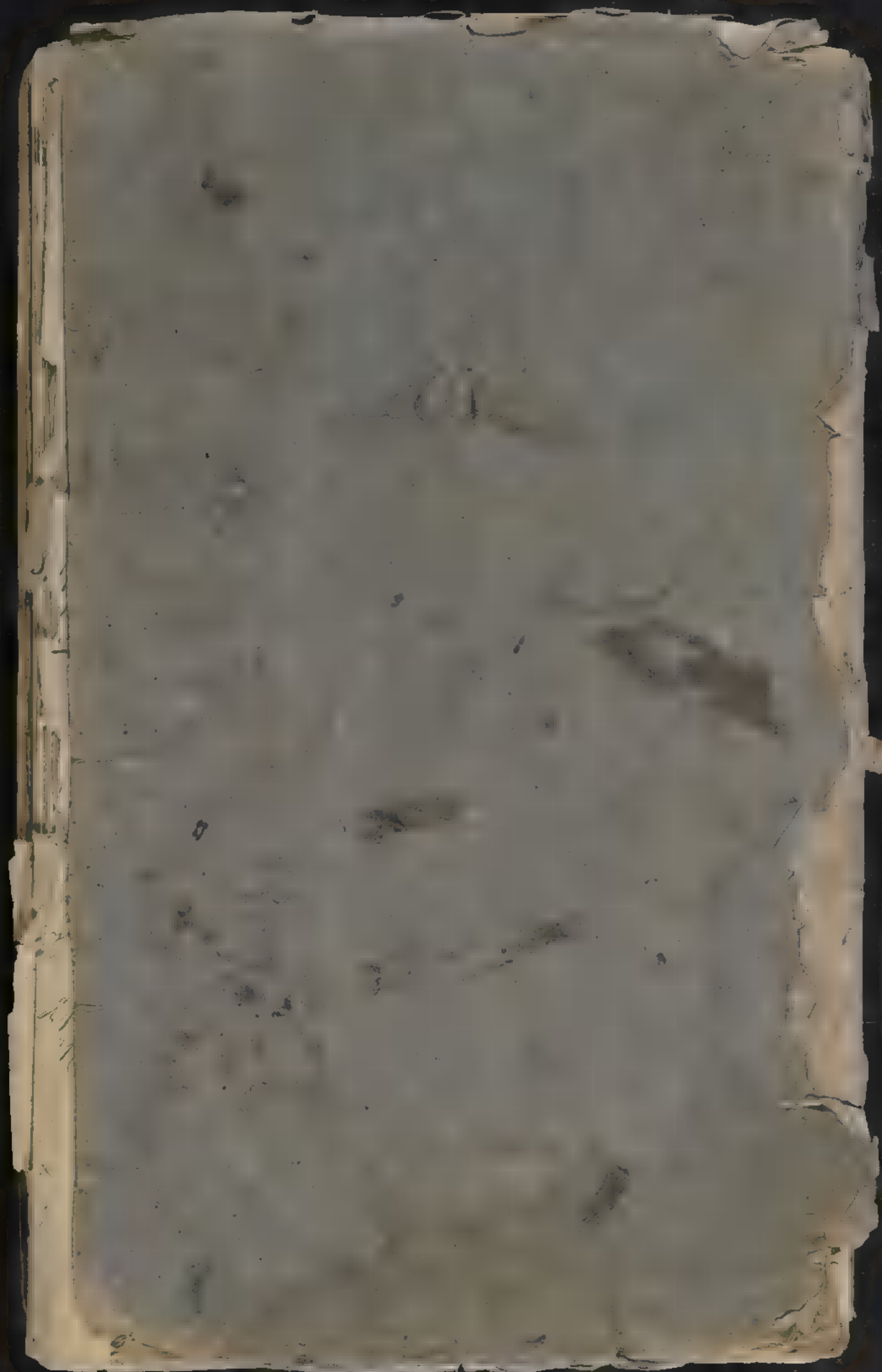


$$\begin{array}{r} 50 \\ 40 \text{ } 26 \\ \hline 9 \text{ } 76 \end{array}$$

Tazett County Pennsylvania Georges Township
Tazett County Pennsylvania Georges Township James
Tazett County Pennsylvania Georges Towns
Tazett County Pennsylvania Georges Township
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Single Rule & Three

25 What must be paid for
53 Ells English 19s of holland
at the rate of 73 yds per yard?

Ans 256 18 3 dms
yds 3 Ells qd
1 : 73 yds :: 53 : 1
4 12 266
11 93 324
374 1064
1867
198
1199 1154
124 500
1256 216 72
20518
20 18 1/4 dms

28 What must be given for a piece
of silver weighing 73 lb. 5 oz. 15 dwt.
at 58 9d per ounce. Ans 253 10 5 dms

oz 3 lb 16 oz dwt
1 : 58 9 :: 73 5 15
20 69 581
17635
158715
105810
20512168 15
12560840 15
205070 20 60
253 10 5 dms Ans

26 What quantity of sugar may
be bought for 26 10 5 dms when the
price of 113 lb is 159 2 5

Ans 76 19 1/2
159 2 5 : 113 lb :: 26 10 5 : 1
20 318 174 530
35784 6364
124
25456
114548
6364
38184 107336 127
16308 71
343656
343656

29 Bought 3 casks of raisins each
weighing 191 ylb. what will they cost at 2 6 8d per
hundred weight? Ans 23 2 1/8

191 ylb 3 casks
2 6 8d per hundred weight
112 62105 11 5545
560 491162 1
610 2023 1/8
560
508
5448
560
11 11 1/8

27 A person failing in trade
owes 747 1/2 and the inventory of his
effects amounts to but 120 6 5
3dms; how much will this prod
uce per pound to his creditors?

Ans 55 7 1/4
747 1/2 : 120 6 5 3dms :: 1
20 9406
100875
1103504 113
3208 126344
1270 8 7 1/4 Ans
1277
2431
2431

30 What will a tax upon 763 lb
155 lb at the rate of 38 6d per
pound. Ans 133 13 10 1/2

$$10 \text{ } 3 \text{ } 2 \text{ } 10 \text{ } 5$$

$$1 : 3.6 :: 763.45$$

$$20 \text{ } 12$$

$$20 \text{ } 12$$

$$152.75$$

$$305.50$$

$$611.00$$

$$20 \text{ } 641.552$$

$$12 \text{ } 320.776 \text{ } 20 = 1$$

$$20 \text{ } 2673 = 1$$

$$133 = 13 = 1 \frac{1}{2} \text{ Ans}$$

31 How many ells English of
Hollane may be bought for 15 l 18 s
1 d 3/4 at 7 s 9 d per yard. Ans 536.19

$$7 \text{ } 9 \text{ } 1/2 : 1 :: 28.18 = 1 \frac{3}{4}$$

$$14$$

$$93$$

$$374$$

$$512$$

$$6217$$

$$124871$$

$$1244$$

$$1431$$

$$1244$$

$$187$$

$$715$$

$$748$$

32 What will 100 ma. of velvet cost
at 18 s 6 d per yard. Ans 539 d 19 s

$$1 : 18.6 :: 100$$

$$14$$

$$16$$

$$1110$$

$$150$$

$$144$$

$$64$$

$$1241$$

$$16$$

$$816 = 2$$

33 A bankrupt compounds
with his creditors for 8 s 7 d per pound
he. and at that rate pays them 420 l
6 s 3 d how much was he indebted
Ans 977 s

$$8 \text{ } 7 \text{ } 1/2 : 1 :: 100 = 8 \text{ } 7 \text{ } 1/2$$

$$103$$

$$113$$

$$9406$$

$$12$$

$$100875$$

$$1403501$$

$$3214$$

$$3180$$

$$2821$$

$$2821$$

$$2821$$

34 What is the value of a silver
tankard weighing 1 lb 7 oz 11 dwt
at 6 s 11 d per ounce. Ans 6 l 11 s 9 d 5

$$10 \text{ } 8 \text{ } 11 \text{ } 10 \text{ } 11$$

$$1 : 6.11 :: 1 \text{ } 7 \text{ } 11 \text{ dwt}$$

$$20 \text{ } 12$$

$$20 \text{ } 76$$

$$12$$

$$394$$

$$76$$

$$2364$$

$$27.58$$

$$20 \text{ } 29.944$$

$$12 \text{ } 1497.120 = 1$$

$$20 \text{ } 1244 = 9$$

$$6 = 11 = 9 \frac{1}{2} \text{ Ans}$$

35 What must be paid for 7
casks of prunes each weighing
2 c. 19 s 11 lb. at 2 l 19 s 8 d per
hundred weight. Ans 49 l 11 s 11 d 1/2

$$112 : 2.19.8 :: 2 = 1.11$$

$$20$$

$$572$$

$$716$$

$$28$$

$$86$$

$$1862$$

$$716$$

$$11862$$

$$13054$$

$$112 \text{ } 1333192$$

$$112$$

$$273$$

$$112$$

$$1008$$

$$392$$

$$336$$

$$56 \text{ } 112 = 2$$

36 At 15 s 8 d per acre what
is the annual rent of 173 A 2 R

$$140 \text{ } 15 \text{ } 8 \text{ } 140 \text{ } 2 \text{ } 11$$

$$1 : 15.8 :: 173.2 = 11$$

$$4$$

$$40$$

$$160$$

$$332$$

$$27740$$

$$332$$

$$88548$$

$$83322$$

$$160 \text{ } 9220968$$

$$8000$$

$$1220$$

$$1120$$

$$1009$$

$$260$$

$$496$$

$$480$$

$$168$$

$$168$$

37 If 5 yards of cloth cost 148²d what must be given for 9 peeces containing each 21 yds. 17²d Ans 27¹d 10¹/₂

$$\begin{array}{r} 21 \times 9 = 189 \\ 189 \times 17 = 3213 \\ 3213 \div 5 = 642 \text{ yds } 3 \text{ d } 3 \text{ qts} \\ 642 \times 148 = 95016 \text{ d } 3 \text{ qts} \\ 95016 \div 1000 = 95 \text{ lb } 1 \text{ lb } 16 \text{ oz } 12 \text{ d } 3 \text{ qts} \end{array}$$

38 If a persons estate be worth 3858 dollars 24 cents a year out of which he saves 1200 dollars how much per day will the remainder be. Ans 728¹/₂ days

$$\begin{array}{r} 3858 \text{ d } 24 \text{ cts} \\ - 1200 \text{ d } 00 \text{ cts} \\ \hline 2658 \text{ d } 24 \text{ cts} \\ 2658 \div 365 = 7 \text{ years } 288 \text{ d } 12 \text{ cts} \end{array}$$

39 If a man's annual income be 1333 dollars and he expends daily 2 dollars 14 cents how much will he save at the years end Ans 551.90 days

$$\begin{array}{r} 1333 \text{ d } 00 \text{ cts} \\ - 730 \text{ d } 00 \text{ cts} \\ \hline 603 \text{ d } 00 \text{ cts} \\ 603 \div 365 = 1 \text{ year } 238 \text{ d } 00 \text{ cts} \end{array}$$

40 If a staff 4 feet long east a shade (on level ground) 7 feet what is the height of that staff whose shade at the same time measures 198 feet 113¹/₂ ft

$$\begin{array}{r} 7 : 4 :: 198 : x \\ x = 113 \frac{1}{2} \text{ ft} \end{array}$$

41 The earth being 360 degrees in circumference turns round on its axis in 24 hours. How far are the inhabitants at the equator carried in one minute degree there being 69¹/₂ miles? Ans 17¹/₂ 3 fur

$$\begin{array}{r} 360 : 24 :: 1 : x \\ x = \frac{24}{360} = \frac{1}{15} \text{ hours} \\ \frac{1}{15} \times 60 = 4 \text{ minutes} \\ 4 \times 69.5 = 278 \text{ miles} \end{array}$$

42 A merchant would lay out in spices 1498 dollars viz cloves at 53 cents per pound mace at 94 cents cinnamon at 10 cents and nutmegs at 21 cents and he would have an equal quantity of each sort what must quantity be? Ans 700 lb of each sort.

$$\begin{array}{r} 53 \text{ cts} \\ 94 \text{ cts} \\ 10 \text{ cts} \\ 21 \text{ cts} \\ \hline 178 \text{ cts} \\ 1498 \div 178 = 8.4157 \text{ lb} \end{array}$$

43 A goldsmith bought of a merchant 14 lb 30z 8dwt of gold for 1371 dollars 20 cents how much per ounce Ans 8 dollars 02

$$\begin{array}{r} 14 \text{ lb } 30 \text{ z } 8 \text{ dwt} \\ = 14.48 \text{ lb} \\ 1371.20 \div 14.48 = 94.7 \text{ dollars} \end{array}$$

44 How many reams of paper at 1 dollar 66 cents. 1 dollar 74 cents and 2 dollars 31 cents per ream and of each an equal number may be purchased with 528 dollars 66 cents Ans 89 reams of each sort



10
 1
 20
 20
 DC
 1.66
 1.97
 2.31 ream
 5.94 : 12 : 528.66
 52866 (89
 4752
 5346
 5346

47 Bought 1476 A. 30R.
 28P. of land at 9 dollars per
 acre the value thereof is re
 quired: Ans 1292, 825 m & ms
 A P A R B
 1 : 9 : 1476.3.28

145 If 9c 3gr. of sugar cost 11 lb
 31 175 6d what will 2c 1gr 11 lb
 cost Ans 6 l 14 s 3d
 1d 3p
 C 9p S C 9p lb
 9 : 3 : 47.14.6 :: 2 : 1.11
 4 20
 39 557
 28 572
 312 6690
 72 263
 1092 20090
 40140
 13380 (12)
 1092/1759470 1611
 1092 2011343
 6674 6.14.3 tons
 6552 £ 5 2
 1227
 1052
 1350
 1092
 2448

1907 140 DC m
 763089
 160/686772 1129232, 5
 640
 467
 320
 1477
 1440
 372
 320
 520
 480
 1200
 2200
 800
 300

32 at 46 To 59c 1gr 11 lb of sugar
 at 288 7d per hundred weight
 what was the amount Ans 8 l 1
 lb S P C 1751d 42
 112 : 28.7 : : 59.1.11
 12 11
 343 287
 28
 1910
 474
 6650
 343
 19950
 66000 (12)
 112/2280950 22365
 221 2011692
 409 1084.171
 396 £ 5 2
 735
 672
 630
 560
 14
 280 1/2

33 with
 no. a
 65 a
 mo

Single Rule of Three

2 What quantity of shalloon that is 3 qrs of a yard wide will line 1/2 yards of cloth that is 1/4 yard wide? Ans 15 yards.

$$\begin{array}{ccc} \text{qr} & \text{yds} & \text{qr} \\ 3 : 1/2 :: 1/4 & & \\ 3 & & 6 \\ \hline 15 & & \end{array}$$

6) 90 Ans

3 If 100 men can finish a piece of work in 12 days how many are sufficient to do it in three days? Ans 400 men.

$$\begin{array}{ccc} \text{days} & \text{men} & \text{days} \\ 12 : 100 :: 3 & & \\ 12 & & 300 \\ \hline 400 & & \end{array}$$

3) 1200 Ans

4 How much in length that is 1 1/4 inches broad will make a square foot Ans 32 inches

$$\begin{array}{ccc} \text{in} & \text{in} & \text{in} \\ 1 1/4 : 1 :: 1/4 & & \\ 1 1/4 & & 1/4 \\ \hline 32 & & \end{array}$$

3) 96 Ans

5 How many yards of matting 2 feet 6 inches broad will cover a floor that is 27 feet long and 20 broad Ans 12 yards.

$$\begin{array}{ccc} \text{ft} & \text{ft} & \text{ft in} \\ 20 : 27 :: 2/6 & & \\ 20 & & 12 \\ \hline 240 & & 30 \\ 27 & & \\ \hline 1680 & & \\ 27 & & \\ \hline 6480 & & \\ 30 & & \\ \hline 216 & & \end{array}$$

3) 6480
3) 216
72 yards

6 How many yards of cloth 3 qrs wide are equal in measure to 30 yards of 5 qrs wide Ans 50 yards

$$\begin{array}{ccc} \text{qr} & \text{yds} & \text{qr} \\ 5 : 30 :: 3 & & \\ 5 & & 30 \\ \hline 150 & & \\ 3 & & \\ \hline 50 & & \end{array}$$

3) 150 Ans

7 If 100 l principal in 12 months gain 6 l. interest what principal will gain the same in 8 months Ans 150 l

$$\begin{array}{ccc} \text{lb} & \text{lb} & \text{lb} \\ 12 : 100 :: 8 & & \\ 12 & & 100 \\ \hline 200 & & \\ 100 & & \\ \hline 150 & & \end{array}$$

3) 200
3) 150 Ans

8 How many yards of paper 1 1/4 yards wide will be sufficient to hang a room which is 20 yards in circumference and 11 in height Ans 64 yards.

$$\begin{array}{ccc} \text{yds} & \text{yds} & \text{yds} \\ 1 1/4 : 20 :: 1/4 & & \\ 1 1/4 & & 1/4 \\ \hline 16 & & 20 \\ 20 & & 5 \\ \hline 320 & & \\ 5 & & \\ \hline 64 & & \end{array}$$

5) 320
64 Ans

9 How many men must be employed to finish a piece of work in 15 days which 5 men can do in 24 days? Ans 8 men

$$\begin{array}{ccc} \text{days} & \text{men} & \text{days} \\ 24 : 5 :: 15 & & \\ 24 & & 15 \\ \hline 120 & & \\ 15 & & \\ \hline 8 & & \end{array}$$

15) 120 (8 men

10 In how many days will 8 men finish a piece of work which 5 men can do in 24 days? Ans 15 days

10
20
20

men days men
5 : 24 :: 8

3120 Days

31
Hob
1d3/4

11 If a footman perform a journey in 3 days when the days are 16 hours long how many days will he require of 12 hours long to perform the same in. Ans 11 days

36 days 36
16 : 3 :: 12

12118 Days Ans

12 If 6 men can reap a field of wheat in 12 days in what time will 24 men do it. Ans 3 days

men days men
6 : 12 :: 24

2472 3 days

32
at

13 How much in length that is 8 poles in breadth must be taken to contain an acre. Ans 20 perches

P P P
160 : 1 :: 8

8160 P Ans

33
wid
no
65
ch

14 A lent B 500l for 6 months. how long ought B to lend A 220l to be equivalent. Ans 13 mo 19 da

500 : 6 :: 220

220 2000 (13 mo 19 da) Ans
220 800
140 20
1420 19 da
2200
1980

15 If when the price of a bushel of wheat is 11s 8d. the penny loaf weighs 12oz what must the penny loaf weigh when a bushel is worth but 3s 8d no 18oz

3 P 0 1/2 S

4 1/2 6 : 12 :: 3

36) 648 (1802 Ans
26
288
288

16 What is the weight of a peal to a steel yard which being suspended 39 inches from the center of motion will equilibrate 208 lb. suspended at the draught end 3 quarters of an inch. Ans 11 lb

3 : 208 :: 3/4

156) 624 (4 lb Ans

17 Suppose 800 persons in garrison with provision sufficient for two months; how many must depart that the provision may serve them 5 months

800 persons 800 ans 1180
2 : 800 :: 5

51600 800
320 320
1180 Ans

18 How many yards of matting that is half a yard wide will cover a room that is 18 feet wide 3 long. Ans 120 yds

18 : 30 :: 1/2 6

18) 6480 (360 Ans
54
1080

19 How wide must a lot of ground be to contain an acre when it is 13 1/2 poles in length. Ans 11 P. 11 yds 2 ft 0 in 2 b.c

$$\begin{array}{r} 160 : 1 :: 13\frac{1}{2} \\ 27 \overline{) 320} \quad 11 \text{ P } 27 \\ \underline{27} \quad \text{P yds ft in b.e} \\ 50 \quad 11-11-20-2 \\ \underline{27} \\ 23\frac{1}{2} \\ 115 \\ \underline{111\frac{1}{2}} \\ 126\frac{1}{2} \\ 27 \overline{) 253} \text{ (yds)} \\ \underline{216} \\ 37 \\ 54 \overline{) 108} \text{ (2 ft)} \\ \underline{108} \\ 0 \\ 36 \\ 54 \overline{) 108} \text{ (2 b.e)} \\ \underline{108} \\ 0 \end{array}$$

20 If when the price of a bushel of wheat is 6s 3d the punning loaf weighs 90% what ought it to weigh when wheat is at 18d per bushel Ans

$$\begin{array}{r} 60\% \cdot 13 \text{ dms} \quad \text{or } 3 \text{ P} \\ 6 \cdot 3 : 9 :: 8 \cdot 2\frac{1}{2} \\ \underline{12} \\ 75 \\ 39 \overline{) 2700} \quad 60\% \text{ } \\ \underline{2364} \\ 336 \\ \underline{2106} \\ 336 \\ 17 \overline{) 276} \text{ (13 ds)} \\ \underline{1436} \\ 1222 \\ \underline{154} \end{array}$$

21 In what time will 600l gain 50l interest when 80l would gain it in 15 years?
 Ans. 2 years.

$$\begin{array}{r} 80 : 15 :: 600 \\ 600 \overline{) 1200} \\ \underline{1200} \\ 0 \end{array}$$

Application 1283

1 If 3 quarters of a yard of vel
 net cost 1s 3d how many yards
 can I buy for 13l 15s 6d Ans

$$\begin{array}{r} 13 \cdot 156 : 3 :: 4 \cdot 3 \\ \underline{20} \\ 275 \\ 12 \\ 3306 \text{ (11)} \\ 87 \overline{) 9918} \quad 28 \cdot 2 \text{ } 8 \text{ ms} \\ \underline{87} \\ 121 \\ \underline{87} \\ 348 \\ \underline{348} \\ 0 \end{array}$$

2 If an ingot of gold weighing
 9lb. 90% is due to be worth 111l 12s.
 what is that per grain Ans

$$\begin{array}{r} 10 \frac{3}{4} \text{ lb } 0 \cdot 2 \text{ dwt } 8 \text{ gr } 9 \text{ p} \\ 9 \cdot 9 \cdot 12 : 111 \cdot 12 :: 1 \\ \underline{12} \\ 114 \\ 20 \cdot 8232 \\ 2352 \quad 19878 \text{ (13)} \\ 9489 \quad 56448 \\ 4704 \quad 42336 \\ 56448 \quad 56448 \\ \underline{141} \end{array}$$

3 A borrower of 250l. for 7
 months and in return lends
 him 300l. how long ought B to
 keep it that the interest of it
 may be equal to that of the first
 sum Ans 5 mo. 45 da.

$$\begin{array}{r} 250 : 7 :: 300 \\ 300 \overline{) 1750} \quad 5 \text{ mo. } 45 \text{ da. } 0 \text{ ms} \\ \underline{1500} \\ 2500 \\ \underline{2500} \\ 0 \end{array}$$

4 If a persons income be 500 guineas a year and he spends 1987d sterling per day how much will he have saved at the years end
Ans 167l 12s 1d. sterling.

$$\begin{array}{r} \text{£} \\ 500 \\ 21 \\ \hline 500 \\ 1000 \\ \hline 10500 \\ 525000 \\ 357000 \\ \hline \text{Ans } 167000 \end{array}$$

$$\begin{array}{r} \text{d} \\ 1987 \\ 12 \\ \hline 1987 \\ 235 \\ \hline 1095 \\ 230 \\ \hline 12185775 \\ 20711200 \\ \hline 357000 \end{array}$$

5 At 13s 2d per yard what is the value of a piece of cloth containing 52 English ells and 3 yds of no 13l 8s 5d 1/4.

$$\begin{array}{r} \text{yds } 52 \\ 13 \\ 2 \\ \hline 158 \\ 634 \\ \hline 1052 \\ 789 \\ \hline 1572 \\ 1166742 \\ 11168502 \\ 12104214 \\ 2086805 \\ \hline \text{Ans } 130805 \frac{1}{2} \end{array}$$

6 If 30 men can perform a piece of work in 11 days: how many men will accomplish another piece of work four times as large in 12 days?
Ans 110 men.

$$\begin{array}{r} \text{days} \\ 11 : 30 \\ \hline 12 : 110 \end{array}$$

$$\begin{array}{r} 12 \\ 110 \text{ men } \text{Ans } (364) \end{array}$$

7 The rents of a whole parish amount to 1750l on which is assessed 32l 16s 3d. what is the rate in the pound. ans 1d 1/2

$$\begin{array}{r} \text{£} \\ 1750 : 32.16.3 :: 1 \\ 20 \\ \hline 35000 \\ 12 \\ \hline 1200007875 \\ 2400 \end{array}$$

$$\begin{array}{r} \text{£} \\ 315000 \\ 15750 \\ \hline 1890000 \\ 1680000 \\ \hline 210000 \\ 840000 \\ 840000 \end{array}$$

8 Bought three tons of oil for 151l 14s 8d gallons of which being damaged I desire to know how I may sell the remainder per gallon so as neither to gain nor lose thereby
Ans 11s 6d 1/4

$$\begin{array}{r} \text{£} \\ 151 \\ 14 \\ 8 \\ \hline 151148 \\ 63 \\ \hline 2684 \\ 36 \\ \hline 350 \\ 72 \\ \hline 756 \\ 85 \\ \hline 4076 \\ 671 \\ \hline 174 \\ 68614 \\ 671 \end{array}$$

9 If the carriage of 5c. 14lb for 96 miles be 32s 6d how far may I have 3c. 19lb carried for the same money?
Ans 151 M. 3 fur. 3 B.

$$\begin{array}{r} \text{c} \\ 5 : 14 : 96 :: 3 : 1 \\ 4 \\ \hline 20 \\ 28 \\ \hline 174 \\ 40 \\ \hline 574 \\ 344 \\ \hline 5166 \\ 55104 \end{array}$$

$$\begin{array}{r} 151 \text{ M} \\ 364 \\ \hline 1820 \\ 504 \\ \hline 142 \\ 11092 \end{array}$$

10 Bought 200 yards of
cambric for 90 l which
being damaged am willin
g to lose 7 l 10 s by the wh
ole at what rate then m
ust it sell per ell Eng
lish Ans 10 s 3 d $\frac{3}{4}$

$$\begin{array}{r} 200 : 82.10 :: 1 \\ \hline 800 \quad 1650 \end{array}$$

$$\begin{array}{r} 800 \overline{) 8250} \quad (10 \frac{3}{4} \text{ Ans} \\ \underline{800} \\ 250 \end{array}$$

$$\begin{array}{r} 3000 \quad (3 \\ \underline{2400} \\ 600 \end{array}$$

$$\begin{array}{r} 2400 \quad (3 \frac{1}{4} \\ \underline{2400} \end{array}$$

11 If for US\$ 22.50. be carried 512 miles how many hundred weight may be carried 64 miles for the same money Ans 1800 C

M Twt M
 512: 225 :: 64
 512
 450

$$\begin{array}{r}
 225 \\
 1125 \\
 \hline
 64) 1152.00 \quad (1800 \text{ rev} \\
 \underline{64} \\
 512 \\
 \underline{512} \\
 00
 \end{array}$$

12 Bought a parcel of cloth at the rate of 6.56c. for every two yards of which a certain quantity was sold at the rate of 18.59c. for every five yards and gained thereby as much as 180 yds cost; how many yards were sold & Ans 1170 yards

$$\begin{array}{r} 3 \text{ } 2 \\ 2 \overline{) 66} \\ \underline{33} \end{array} \quad \begin{array}{r} 3 \text{ } 7 \\ 5 \overline{) 187} \\ \underline{37} \\ \underline{33} \\ 6 \end{array}$$
$$\begin{array}{r} 3 \cdot 9 \\ 3 \cdot 3 \\ \hline 6 \end{array} \quad \begin{array}{r} 5 \cdot 2 \\ 6 \cdot 6 \\ 12 \\ \hline 28 \end{array}$$

$$\begin{array}{r} 180 \div 70 \\ \hline 2 \text{ yds} \\ 6 \text{ yds} \end{array}$$

$$1 : : 7020$$

$$\begin{array}{r} 7020 \\ 1170 \text{ Ans} \end{array}$$

13 A certain steeple projected upon level ground a shadow to the distance of 693 ft. when a staff 3 feet in length perpendicularly erected cast a shadow 6 ft. when from hence the height of the steeple is required.

At in ft 80 to 100 yds

$$\frac{6.4}{12} : 3 :: \frac{6.33}{12} : 11$$

76 7600 ③
76) 22800 (300
 22800 10000

111 If 12 yards of yarn wide silk
66 exactly line 8 yards of silk
of another breadth: how many yar-
ds of the latter will line 21 pieces
of the former each piece containing
20 yards? Ans 320 yards.

$\frac{12}{12} : 8 :: \frac{24}{20}$

$\frac{13816}{320} \text{ Ans}$

15 Laid out 100 l. upon serges and
shalloons: the value of the
shalloons was 60 l and the quantity
of serge 237 yards also for every two
yards of serge there were three
of shalloon how many yards
of shalloon were there and what
was the value of one yard of
each sort. Ans 355 $\frac{1}{2}$ yds. shal
loon 38 11d $\frac{1}{2}$ + each per yard

$$\begin{array}{r} 100 \text{ yds} \\ 60 \\ \hline 110 : 237 :: 60 \\ 110 \overline{) 14220} \\ 355 \frac{1}{2} \text{ yards} \end{array}$$

$$\begin{array}{r} 237 \overline{) 800} \quad (3811 \text{ yds} \\ 711 \\ \hline 89 \\ 12 \\ \hline 1068 \quad (11 \text{ p} \\ 912 \\ \hline 129 \\ 1180 \quad (211 \\ 1124 \\ \hline 56 \end{array}$$

16 How many pieces of Holland each 33 ells Flemish 199
2 na may be had for 118 17 1/2
when 11 ells English cost
11 15 100 Ans 16 pieces 33 ells 199
11 15 100 : 11 :: 118 17 1/2

$$\begin{array}{r} 20 \\ 27 \\ 12 \\ \hline 334 \\ 11 \\ \hline 1336 \end{array}$$

$$\begin{array}{r} 1336 \overline{) 15650} \quad (11 \text{ ells English} \\ 4008 \\ \hline 5570 \\ 5344 \\ \hline 2264 \\ 1336 \\ \hline 928 \\ 14640 \quad (3 \text{ yr} \\ 14008 \\ \hline 632 \\ 12528 \quad (1 \text{ na} \end{array}$$

Flemish 199 na
33 1/2
100 1/2
402 1/2 ells English
341 1/2 3 1/2
5
1708 1/2 pieces ells 199 na
402 1/2 6833 (16 - 33 - 1 - 1) Ans
402
2813
2412
401 remainder
4 1/2 100 1/2
3 1/2 33 1/2 1 1/2
ells 199 na

17 A factor bought 64 pieces of Holland which cost him 352 l. at 5 s 6 d. per ell Flemish: how many yards were there in all and how many ells English in each piece
Ans 760 yds. 12 ells each piece.

$$\begin{array}{r} 3 \text{ ells} \\ 5 \cdot 6 : 1 :: 352 \\ 12 \\ \hline 66 \end{array}$$

$$\begin{array}{r} 70 \frac{1}{2} \text{ ells} \\ 12 \\ \hline 841 \frac{1}{2} \quad (1280 \\ 66 \\ \hline 134 \\ 132 \\ \hline 528 \\ 528 \end{array}$$

ells Flem
1280
11 35 1/2
960 yds Ans

ells Flem
1280
5738 1/2
pieces 64 1/2 768 (12 ells each piece Ans
64
128
128

18 If a pole perpendicular to the horizon of 50 ft. 11 in. in length when the sun is on the meridian cast a shadow 98 feet 6 in. long; what is the breadth of a river that running due east and west within 20 ft. 6 in on the north side of the foot of a steeple, 300 ft. 8 in. high which at the same time casts the extremity of its shadow 30 ft. 9 in. beyond the stream
Ans 176 yds. 2 ft. 11 in.

days 36
 365 6
 24
 1466
 730
 8766 60 Miles M
 $525960 : 596900000 :: 1$
 $\begin{array}{r} 596900000 \\ 525960 \overline{) 1134+} \\ 709400 \text{ miles} \\ 525960 \text{ Ans} \\ 1834400 \\ 15778800 \\ 25652110 \end{array}$

24 Isaac Newton and others
 have found by nice experi-
 ments that sound flies at
 the rate of 1142 feet per second
 and a person in health has
 about 75 beats of the artery or
 pulsations in a minute: now
 the breadth of a river is requi-
 red at one side of which A.
 firing a gun B. directly opposite
 at the other counts six pulsa-
 tions at his wrist between see-
 ing the flash and hearing the
 report Ans 5481 ft. or 1 mile 201

ft
 Pul 11420 Pulsations
 $75 : 68520 :: 6$
 $75 \overline{) 411120} (5481 \text{ ft. Ans}$
 $\begin{array}{r} 352 \\ 361 \\ 300 \\ 612 \\ 600 \\ 120 \end{array}$
 ft ft
 $5280 \overline{) 5481} (1 \text{ mile } 201 \text{ ft}$
 $\begin{array}{r} 5280 \\ 201 \end{array}$ Ans

25 If the report of a piece
 of ordnance be heard one
 minute and three seconds
 after the flash was observed:
 the distance is required. Ans
 13 miles 5 furlongs.

sec ft M sec
 $1 : 1142 :: 63 : 3$
 $\begin{array}{r} 3426 \\ 63 \overline{) 21582} \end{array}$
 ft 3426
 $63 \overline{) 21582} (13 \text{ miles}$
 $\begin{array}{r} 71946 \\ 5280 \overline{) 215820} \\ 19146 \\ 24360 \\ 15840 \\ 660 \overline{) 3300} \end{array}$
 yds 19146
 $660 \overline{) 3300} (5 \text{ furlongs}$

Last
 Sum

Double Rule of Three

Suppose 11 men in 12 days mow 118 acres: how many acres can 8 men mow in 16 days?
Ans 128 acres.

$$\begin{array}{r}
 11m \} \text{ 118 } \{ 8m \\
 12d \} \text{ 16d } \\
 118 \\
 118 \\
 1024 \\
 512 \\
 118 \} 6114 \text{ (128 acres)} \\
 118 \\
 1311 \\
 96 \\
 384 \\
 384
 \end{array}$$

3 If 12 oxen in 16 days eat 20 acres of grass: how many acres will serve 21 oxen 118 days? Ans 120 acres.

$$\begin{array}{r}
 12ox \} \text{ 20 } \{ 21ox \\
 16d \} \text{ 118d } \\
 20 \\
 192 \\
 96 \\
 12 \} 1152 \text{ A} \\
 192 \\
 123000 \text{ (120 acres)} \\
 192 \\
 384 \\
 384
 \end{array}$$

11 If 10 bushels of oats be sufficient for 18 horses 20 days: many bushels will serve 60 horses 36 days at that rate
Ans 60 bushels.

$$\begin{array}{r}
 18h \} \text{ 20d } \{ 60h \\
 20d \} \text{ 36d } \\
 360 \\
 2160 \\
 121600 \text{ 60 bush} \\
 2160 \text{ Ans}
 \end{array}$$

5 If 56 lb. of bread be sufficient for 7 men 14 days: how many pounds will suffice 21 men 3 days. Ans 36 lb.

$$\begin{array}{r}
 7m \} \text{ 56 lb } \{ 21m \\
 14d \} \text{ 3d } \\
 56 \\
 98 \\
 63 \\
 56 \\
 378 \\
 315 \\
 13528 \text{ 36 lb Ans} \\
 2948 \\
 588
 \end{array}$$

6 If 8 men have 36 lbs. for 14 days work: how much ought 18 men to receive for 16 days. Ans 76 lb 16 s.

$$\begin{array}{r}
 8m \} \text{ 36 lb } \{ 18m \\
 14d \} \text{ 16d } \\
 36 \\
 64 \\
 288 \\
 48 \\
 768 \\
 64 \\
 3072 \\
 4608 \\
 32 \} 49152 \text{ (20)} \\
 32 \\
 171 \\
 160 \\
 115 \\
 192 \\
 192
 \end{array}$$

7 If 700 dols. in half a year raise 14 dols. interest: what will be the interest of 400 dols. for 5 years? Ans. 80 dols.

$$\begin{array}{r}
 700d \} \text{ 14 } \{ 400d \\
 1/2y \} \text{ 5y } \\
 350 \\
 2000 \text{ dols} \\
 14 \\
 350 \} 28000 \text{ (80)} \\
 2800 \text{ Ans}
 \end{array}$$

8 If 112 acres of grass be mowed by 16 men in 8 days: how many acres may 24 men mow in 19 days.

Ans 1156 acres.

$$\begin{array}{r} 16m \quad 8d \quad \{ 112a \\ 24m \quad 19d \quad \{ 1156a \\ 112 \quad 216 \\ 24 \quad 1156 \\ 112 \quad 912 \\ 1156 \quad 456 \\ 112 \quad 51072 \quad 1156 \\ 1118 \quad \text{Ans} \\ 627 \\ 560 \\ 672 \end{array}$$

9 If 16l 18s. be the wages of 16 men for 8 days: what sum will 32 men earn in 24 days? Ans 101l 8s.

$$\begin{array}{r} 16m \quad 8d \quad \{ 16l \ 18s \\ 32m \quad 24d \quad \{ 101l \ 8s \\ 128 \quad 338 \quad 128 \\ 611 \\ 2304 \quad (c) \\ 128 \quad 25958 \quad 2028 \\ 256 \quad 1018 \\ 356 \quad \text{Ans} \\ 1024 \\ 1024 \end{array}$$

10 If 75l. in 9 months amount to 78l 7s 6d. at what rate percent is the interest computed? Ans 6l. per cent

$$\begin{array}{r} 75l \quad 9m \quad \{ 78l \ 7s \ 6d \\ 9000 \quad 12M \\ 675 \quad 81200 \\ 675 \quad 972000 \quad 11140 \\ 675 \quad 2970 \\ 2700 \quad 2700 \end{array}$$

11 Suppose the wages of 6 persons for 21 weeks be 120l what will be the hire of 111 persons for 46 weeks. Ans 613l 6s 8d.

6l } 120 } 1116
21w } 120 } 116w
126

$$\begin{array}{r} 84 \\ 56 \\ 644 \\ 120 \\ 12880 \\ 644 \\ 12880 \\ 126 \quad 77280 \quad 613 \ 6 \ 8 \\ 756 \quad \text{Ans} \\ 168 \\ 420 \\ 378 \\ 112 \\ 126 \quad 840 \quad 68 \\ 756 \\ 84 \\ 12 \\ 1008 \end{array}$$

12 What is the interest of 259l 13s 5d. for 20 weeks at 5 per cent? Ans 11l 19s 10d

$$\begin{array}{r} 52w \quad \{ 5\% \quad \{ 20w \quad \{ 2 \\ 100 \quad \{ 5 \quad \{ 259 \ 13 \ 5 \\ 2000 \\ 26000 \\ 48000 \\ 120000 \\ 1248000 \\ 62321 \\ 1216420 \\ 16232100 \quad 11l \\ 4992000 \\ 1240100 \\ 124802000 \quad 19s \\ 1248000 \\ 12322000 \\ 11232000 \\ 10900012 \\ 13080000 \quad 10d \\ 1248000 \\ 600004 \\ 2400000 \quad 11d \ 6a \\ 1248000 \end{array}$$

13 If 2 men can do 12 rods of ditching in 6 days: how many rods may be done by 8 men in 24 days? Ans 192 rods.

$$\begin{array}{r} 2m \quad 6d \quad \{ 12r \\ 8m \quad 24d \quad \{ 192r \\ 192 \\ 12 \\ 12 \quad 2304 \\ 192 \quad \text{Ans} \end{array}$$

14 If the carriage of 8 cwt. 128 miles cost 6.40; what must be paid for the carriage of 11 cwt. 32 miles. Ans 8080

$$\begin{array}{r} \text{8 cwt } \left\{ \begin{array}{l} 26 \\ 128 \text{ m} \end{array} \right\} \begin{array}{l} 6.40 \\ 32 \text{ m} \end{array} \\ \hline 1024 \\ \hline \text{11 cwt } \left\{ \begin{array}{l} 26 \\ 32 \text{ m} \end{array} \right\} \begin{array}{l} 6.40 \\ 32 \text{ m} \end{array} \\ \hline 1280 \\ \hline 8080 \end{array}$$

15 If 200 lb be carried 40 miles for 10 cts. how much must be paid at that rate for the carriage of 20200 lb. 60 miles. Ans 60,60 cts

$$\begin{array}{r} 200 \text{ lb } \left\{ \begin{array}{l} 6 \\ 40 \text{ m} \end{array} \right\} \begin{array}{l} 20200 \text{ lb} \\ 60 \text{ m} \end{array} \\ \hline 8000 \\ \hline 1212000 \\ \hline 60,60 \text{ cts} \end{array}$$

16 If the freight of 9 hogs heads of sugar each weighing 12 hundred weight for 20 leagues cost 16. what must be paid for the freight of 50 casks of oil each weighing 24 hundred weight 100 leagues. Ans 92 115 10 p

$$\begin{array}{r} 9 \times 12 = 108 \text{ } \left\{ \begin{array}{l} 16 \\ 20 \text{ leagues} \end{array} \right\} \begin{array}{l} 125 \\ 100 \text{ leagues} \end{array} \\ \hline 2160 \\ \hline 12500 \\ \hline 2160 \times 42 = 91120 \\ \hline 12500 \times 42 = 525000 \\ \hline 525000 - 91120 = 433880 \\ \hline 433880 \div 42 = 10330 \text{ } \left\{ \begin{array}{l} 11 \text{ s } \\ 10 \text{ p} \end{array} \right\} \end{array}$$

17 If 4 dollars be the hire of 8 men for three days: how many days must 20 men work for 40 dollars. Ans 12 days

2 If 4 dollars be the hire of 8 men for three days: how many days must 20 men work for 40 dollars. Ans 12 days

$$\begin{array}{r} 4 \text{ dollars } \left\{ \begin{array}{l} 3 \text{ days } \\ 8 \text{ men} \end{array} \right\} \begin{array}{l} 40 \text{ dollars} \\ 20 \text{ men} \end{array} \\ \hline 20 \\ \hline 32 \text{ } \left\{ \begin{array}{l} 3 \text{ days } \\ 20 \text{ men} \end{array} \right\} \begin{array}{l} 40 \text{ dollars} \\ 20 \text{ men} \end{array} \\ \hline 196 \text{ } \left\{ \begin{array}{l} 3 \text{ days } \\ 20 \text{ men} \end{array} \right\} \begin{array}{l} 40 \text{ dollars} \\ 20 \text{ men} \end{array} \\ \hline 12 \text{ days} \end{array}$$

3 If 11 men have 7 shillings for three days work: how many men will earn 4.165 in 16 days. Ans 3 men

$$\begin{array}{r} 11 \text{ men } \left\{ \begin{array}{l} 3 \text{ days } \\ 7 \text{ shillings} \end{array} \right\} \begin{array}{l} 4.165 \\ 16 \text{ days} \end{array} \\ \hline 16 \\ \hline 28 \text{ } \left\{ \begin{array}{l} 3 \text{ days } \\ 11 \text{ men} \end{array} \right\} \begin{array}{l} 4.165 \\ 16 \text{ days} \end{array} \\ \hline 1152 \text{ } \left\{ \begin{array}{l} 3 \text{ days } \\ 11 \text{ men} \end{array} \right\} \begin{array}{l} 4.165 \\ 16 \text{ days} \end{array} \\ \hline 3 \text{ men} \end{array}$$

4 Suppose the interest of 333 6.88 for 9 months be 156 what principal in 12 months will gain 6. Ans 100. 5

$$\begin{array}{r} 333 \text{ } \left\{ \begin{array}{l} 9 \text{ months } \\ 156 \text{ interest} \end{array} \right\} \begin{array}{l} 6.88 \\ 12 \text{ months} \end{array} \\ \hline 54 \\ \hline 333 \text{ } \left\{ \begin{array}{l} 9 \text{ months } \\ 156 \text{ interest} \end{array} \right\} \begin{array}{l} 6.88 \\ 12 \text{ months} \end{array} \\ \hline 100 \end{array}$$

5 If 200 lb. be carried 40 miles for 10 cts: how far may 20200 lb be carried for 6060. Ans 60 miles. 20

$$\begin{array}{r} 200 \text{ lb } \left\{ \begin{array}{l} 40 \text{ miles } \\ 10 \text{ cts} \end{array} \right\} \begin{array}{l} 20200 \text{ lb} \\ 6060 \end{array} \\ \hline 80800 \\ \hline 1212000 \\ \hline 148480000 \text{ } \left\{ \begin{array}{l} 60 \text{ miles} \\ 20 \text{ cts} \end{array} \right\} \end{array}$$

6 If 115 men can make a wall 32 feet high and 40 feet long in 8 days: in how many days can 68 men build a wall 28 feet high of the same length
Ans 114 days 11 h +

$$\begin{array}{r}
 115 \text{ m } \{ \begin{array}{l} 32 \text{ ft} \\ 40 \text{ ft} \end{array} \} 8 \text{ days} \{ \begin{array}{l} 68 \text{ m} \\ 28 \text{ ft} \end{array} \} \\
 \hline
 68 \quad 115 \\
 256 \quad 28 \\
 192 \quad 1160 \\
 \hline
 2176 \quad 290 \\
 \hline
 4060 \text{ days} \\
 \hline
 32480 \quad 114 \text{ days} \\
 2176 \quad 11 \\
 \hline
 10720 \\
 8704 \\
 \hline
 2016 \\
 \hline
 24192 \quad 11 \text{ h} + \\
 2176 \\
 \hline
 2432 \\
 2176
 \end{array}$$

7 If a foot man when the days are 11 hours long can travel 276 miles in 16 days: in how many days can he travel 852 miles when the days are but 12 hours long: Ans 57 days 7 hours +

$$\begin{array}{r}
 11 \text{ h } \{ \begin{array}{l} 276 \text{ m} \\ 16 \text{ days} \end{array} \} \{ \begin{array}{l} 12 \text{ h} \\ 852 \text{ m} \end{array} \} \\
 \hline
 12 \quad 14 \\
 3312 \quad 3408 \\
 \hline
 852 \\
 11928 \\
 \hline
 71568 \\
 11928 \\
 \hline
 190848 \quad 57 \text{ days} \\
 16560 \\
 \hline
 25248 \\
 23184 \\
 \hline
 2064 \\
 \hline
 24768 \quad 7 \text{ hours} \\
 23184
 \end{array}$$

8 If 15 men eat 3 shillings worth of bread in 6 days when wheat is sold at nine shillings per bushel: how many days will 30 men require to eat 135 11d. worth when wheat is at 6s. per bushel. Ans 20 days.

$$\begin{array}{r}
 3 = 36d \quad 15 \text{ m } \{ \begin{array}{l} 6 \text{ days} \\ 30 \text{ m} \end{array} \} \{ \begin{array}{l} 160d = 13 \text{ s } 4d \\ 15 \end{array} \} \\
 \hline
 30 \quad 15 \\
 1080 \quad 2400 \\
 \hline
 6480 \quad 11400 \\
 \hline
 1129600 \quad 20 \text{ days} \\
 112960
 \end{array}$$

9 If 100l. principal in 12 months gain 8l. interest: what principal will gain 8l. 12s. in 5 months. Ans 258l

$$\begin{array}{r}
 100 \text{ l } \{ \begin{array}{l} 12 \text{ m} \\ 8 \text{ l } 12 \text{ s} \end{array} \} \{ \begin{array}{l} 5 \text{ m} \\ 8 \text{ l } 12 \text{ s} \end{array} \} \\
 \hline
 8 = 160s \quad 100 \quad 5 \text{ m} \quad 8 \text{ l } 12 \text{ s} \\
 \hline
 800 \quad 206100 \\
 \hline
 1206100 \\
 158 \text{ l } \text{ Ans}
 \end{array}$$

10 Suppose 100l. will defray the expenses of 5 men for 22 weeks and 6 days: how long will 12 men be spending 150 l. Ans 11 weeks 2 days.

$$\begin{array}{r}
 100 \text{ l } \{ \begin{array}{l} 22 \text{ weeks} \\ 6 \text{ days} \end{array} \} \{ \begin{array}{l} 150 \text{ l} \\ 12 \text{ m} \end{array} \} \\
 \hline
 5 \text{ m } \{ \begin{array}{l} 22 \text{ weeks} \\ 6 \text{ days} \end{array} \} \{ \begin{array}{l} 150 \text{ l} \\ 12 \text{ m} \end{array} \} \\
 \hline
 12 \quad 160 \quad 5 \\
 1200 \quad 750 \\
 \hline
 15000 \\
 750 \\
 \hline
 120000 \\
 11 \text{ weeks } 2 \text{ days} \text{ Ans}
 \end{array}$$

Application.

1. If 7 bushels of malt be sufficient for 7 persons 11 months how many bushels will serve 116 persons 10 months. Ans 115 bushels.

$$\begin{array}{r} 7B \} 7 \} 116B \\ 11m \} 7 \} 10m \\ \hline 28 \quad 1160 \\ \hline 13220 \quad (115 \text{ bushels}) \\ 28 \quad 1150 \\ \hline 1110 \end{array}$$

2 How many men must be employed to reap 240 acres in 12 days if 36 men can reap 60 acres in 5 days.

Ans 60 men.

$$\begin{array}{r} 60 \text{ men} \} 240 \text{ A} \\ 5d \} 36 \} 12 \\ \hline 12 \quad 5 \\ \hline 720 \quad 1200 \\ \hline 3600 \\ \hline 43200 \quad (60 \text{ men}) \\ 12 \quad 43200 \end{array}$$

3 If 5 men make 300 pair of shoes in 40 days how many men may make 900 pair in 60 days. Ans 10 men.

$$\begin{array}{r} 300P \} 5 \text{ men} \} 900P \\ 40d \} 5 \} 60d \\ \hline 60 \quad 40 \\ \hline 18000 \quad 36000 \\ \hline 180000 \\ 10 \text{ men} \text{ Ans} \end{array}$$

4 A porter having received 112 shillings for the carriage of 3c. wt. 150 miles. how much ought he to have for the conveyance of 7c. 2qr. 14lb. 50 miles? Ans 35s 7d.

$$\begin{array}{r} \text{cwt} \quad 3 = 336 \text{ lb} \} 112 \} 85 \text{ lb} = 7 \cdot 2 \cdot 11 \\ 150 \text{ m} \} 42 \} 50 \text{ m} \\ \hline 16800 \quad 42700 \\ 336 \quad 42 \\ \hline 50400 \quad 85400 \\ \hline 170800 \\ 1793400 \quad (35 \text{ s}) \\ 152200 \\ \hline 281400 \\ 252000 \\ \hline 29400 \\ 352800 \quad (7 \text{ d}) \\ 352800 \end{array}$$

5 A person having engaged to remove 8000c. wt. a certain distance in 9 days. with 18 horses in 6 days he removed 4500cwt. how many horses will be required to remove the remainder in the remaining 3 days. Ans 28 horses.

$$\begin{array}{r} 8000 \text{ cwt} \} \text{horses} \} 8000 \\ 4500 \text{ cwt} \} 18 \} 4500 \\ 6d \} 18 \} 3d \\ \hline 3 \quad 6 \\ \hline 13500 \quad 21000 \\ \hline 168000 \text{ horses} \\ 21000 \\ \hline 378000 \quad (28 \text{ horses}) \\ 27000 \quad (Ans) \\ \hline 108000 \\ 108000 \end{array}$$

6 If 20 hundred weight be carried 50 miles for 5s how much will forty hundred weight cost to be conveyed 100 miles Ans 20s.

$$\begin{array}{r}
 20006 \text{ } \{ \text{ } \} \text{ } 110006 \\
 50m \text{ } \{ 5 \text{ } \} \text{ } 100m \\
 \hline
 100000 \text{ } \{ \text{ } \} \text{ } 1100000 \\
 \hline
 12000000 \\
 20 \text{ } \{ \text{ } \} \text{ } \text{Ans}
 \end{array}$$

7 A farmer having sown 118 bushels found that it produced 576 bushels the first year; now supposing he sows 240 bushels of grain each year for 6 years successively: what will be his whole increase at the expiration of the last year. Ans 17280 bushels.

$$\begin{array}{r}
 118 \text{ } \{ \text{ } \} \text{ } 240 \text{ } \{ \text{ } \} \text{ } \\
 14 \text{ } \{ 576 \text{ } \} \text{ } 64 \\
 \hline
 118 \\
 1140 \\
 576 \\
 8640 \\
 10080 \\
 7200 \\
 118 \text{ } \{ 829440 \text{ } \} \text{ } 17280 \text{ } \{ \text{ } \} \text{ } B \\
 \hline
 118 \\
 3119 \\
 336 \\
 134 \\
 26 \\
 384 \\
 3840
 \end{array}$$

8 If 12 men in 6 days reap 80 acres: in how many days will 25 men reap 200 acres. Ans 745 days.

$$\begin{array}{r}
 12m \text{ } \{ \text{ } \} \text{ } 80 \text{ } \{ \text{ } \} \text{ } \text{days} \text{ } \{ 25m \text{ } \} \text{ } 200 \text{ } \{ \text{ } \} \text{ } \\
 80 \text{ } \{ \text{ } \} \text{ } 6 \text{ } \{ 200 \text{ } \} \text{ } 12 \\
 \hline
 25 \\
 2000 \\
 2400 \\
 114100 \text{ } \{ 745 \text{ } \} \text{ } \text{Ans} \\
 14000 \\
 1000 \\
 400 \text{ } \{ 2000 \text{ } \} \text{ } 5
 \end{array}$$

9 An usurer put out 86l. To receive interest for the same and when it had continued 8 months he received for principal and interest 88l 17s 11d. query the rate per cent. Ans 5 per cent.

$$\begin{array}{r}
 88 \text{ } \{ \text{ } \} \text{ } 17 \text{ } \{ \text{ } \} \text{ } 11 \\
 86 \\
 \hline
 86 \text{ } \{ \text{ } \} \text{ } 2 \text{ } \{ \text{ } \} \text{ } 17 \text{ } \{ \text{ } \} \text{ } 11 \text{ } \{ 100 \text{ } \} \text{ } \\
 8m \text{ } \{ 57 \text{ } \} \text{ } 12 \text{ } \{ \text{ } \} \text{ } 12m \\
 \hline
 688 \\
 688 \text{ } \{ 1200 \text{ } \} \text{ } 1200 \\
 1825600 \text{ } \{ 1200 \text{ } \} \text{ } 1200 \\
 \hline
 20 \text{ } \{ \text{ } \} \text{ } 5 \text{ } \{ \text{ } \} \text{ } \text{Ans}
 \end{array}$$

Practice

Practice

2 Bought 97. 19c. 3qr. 27
lb³⁴ of iron, at 39^l 19s 11d. 7¹/₂
per ton; what was the amount
Ans 399^l 19s 11d. 7¹/₂

39-19-11 1/2

| cwt | lb | qr | lb | qr | lb |
|-------|-----|-----|----|--------|----|
| 10 | 2 | 359 | 19 | 7 1/2 | |
| 4 | 5 | 19 | 19 | 11 3/4 | |
| 4 | 5 | 7 | 19 | 11 3/4 | |
| 1 | 6 | 7 | 19 | 11 3/4 | |
| qr | 1 | 1 | 19 | 11 3/4 | |
| 1 | 2 | 0 | 19 | 11 3/4 | |
| | | 0 | 09 | 11 3/4 | |
| | | 0 | 04 | 11 3/4 | |
| lb | 1/2 | 0 | 02 | 5 3/4 | |
| 7 | 2 | 0 | 01 | 5 | |
| 11 | 7 | 0 | 00 | 8 1/2 | |
| 2 | 2 | 0 | 00 | 2 | |
| 3 1/4 | 1/2 | 0 | 00 | 1 | |
| 1/4 | 2 | | | | |

399-19-11 Ans

Tare and Trett

2 what is the neat weight of
1156^l 19^l 19 lb of tobacco tare
in the whole 15c. 2qr. 13 lb.
and what is the amount there
of at 1^l 15s 8d. per cwt & 11s
neat 1140^l 3qr 6 lb. amount
786^l 13 11d 3/4 cwt 9^l lb

| | | |
|--------------|--|--|
| 1156-19-19 | | |
| 15 2 13 | | |
| 1140-3-6 | | |
| 1-15-8 | | |
| 17 16 8 | | |
| 178 6 8 | | |
| 713 6 8 | | |
| 71 6 8 | | |
| 17 10 | | |
| 8 11 | | |
| 1 3 1/4 | | |
| 0 4 1/2 | | |
| 786 1 11 3/4 | | |

3 How much is the neat weight
of 36 hogsheads of tobacco weigh-
ing gross 201c. 3qr. 12 lb tare in
the whole 3140 lb. and what does
it come to at 1^l 17s 6d. per hun-
dred weight & 11s neat 173c. 3qr.
8 lb. value 325^l 18s 3d 7/2

112) 3140 (201-3-12
224 28-0-11
900 173-3-8 neat
325

lb L S D cwt qr lb
112 : 1-17-6 :: 173-3-8

| No | cwt | qr | lb | Amount |
|----|-----|----|----|--------|
| 1 | 11 | 2 | 14 | 27 |
| 2 | 3 | 0 | 17 | 19 |
| 3 | 5 | 3 | 10 | 18 |
| 4 | 6 | 1 | 16 | 18 |
| 5 | 3 | 2 | 18 | 19 |
| 10 | 0 | 6 | 11 | 18 |
| 9 | 2 | 16 | | |

Amount lbs

112: 2-17-4 :: 12-3-19

112: 2-17-6 :: 9-2-16

Case 2 SS

$$\begin{array}{r}
 3/7 \\
 22190 \\
 1120 \\
 \hline
 21070 \text{ amount}
 \end{array}$$

$$\begin{array}{r}
 12-6 \\
 10 \\
 \hline
 6-5-0 \\
 10 \\
 \hline
 62-10-0 \\
 10 \\
 \hline
 25-0-0 \\
 10 \\
 \hline
 250-0-0 \\
 2 \\
 \hline
 00-0-0 \\
 2 \\
 \hline
 25-0-0 \\
 2 \\
 \hline
 143-15-0 \\
 2 \\
 \hline
 168-15-0
 \end{array}$$

Ans

27465384 1600 ④

28) 1600 57

1400

200

196

4

out gr lb

86-2-14

14 1 4

112:3-15-10::72-1-10

cont gr ll
 18.2-0
 1 1 8
 17.0-20 neat 17.0-20
 ll S D 138
 1:4-6::1924

Ms. A. 9. 2. 3. 11

2 What is the neat weight and value of 40 bags of figs gross 75c. 39s. 14 lb tare per hundred weight 14 lb at 18s 6d. per cwt Ans neat 66c. 19s. 16 lb value 61l 8s 3d

lb 3 1/2 cwt gr lb
 112 : 18-6 :: 66-1-16

3 Told 9 hogsheads of sugar
 each 60.2 gr 12 lb. gross tare
 per hundred weight 17 lb wh
 at is the neat weight: and wh
 at does it amount to at 2 l
 125 6d per hundred weight
 Ans neat 50c 1 gr 22 lb amou
 nt 132 l 83 5dys cwt gr lb
 59-1-24 6-2-12
 9 0 2 59-1-24
 50 1 22 neat

237
 28
 1960
 476
 6660 36
 46620 9-0-2
 6660
 112) 11322 0 28 1010
 112 84
 122 170
 112 168
 2
 lb 2 1/2 cwt gr lb
 112 : 2-12-6 :: 50-1-22

11 Bought 4 hogsheads of
 sugar weighing 43c. 3 gr
 21 lb gross tare 12 lb per
 hundred weight required
 the neat weight and its va
 lue at 2 l 15 5 1/2 per hund
 red weight Ans neat
 39c 25 lb 120% value 108 l
 105 7d 3/4 cwt gr lb
 43-3-21
 4 cwt gr lb 02
 125 43-3-21-0
 28 4-2-23-4
 1401 39 0-25-12
 352
 4921 12
 59052 neat ans

112) 59052 (28) 527 (18)
 560 28
 305 247
 224 224
 812 23
 784
 28
 168
 28
 1448 (1107)

lb 2 1/2 cwt gr lb 02
 112 : 2-15-11 :: 39-0-25-12

III CASH III

2 In 8c 3 gr 20 lb. gross tare
 38 lb tret 14 lb in every 100 lb
 how many pounds neat: and wh
 at do they come to at 8d per lb
 Ans neat 925 lb. value 32 l 15 s
 2 d 1/2 cwt gr lb
 8-3-20
 4
 35
 28
 280
 72
 gross 1000
 tare 38
 962
 37
 925
 26) 962 (37 tret)

1 : 8 1/2 :: 925

3 Bought 120c 2 gr. gross of
 sugar: tare 176 lb tret 14 lb per
 100 lb what is the neat weig
 ht and its value at 2 l
 25 s per hundred weight
 Ans neat 116 1 gr 12 lb
 value 249 l 13 s 6 1/4

cwt gr lb
 120-2-0
 482
 28
 3856 26)13320(512
 964 130
 13496 32
 176 tare 26
 13320 60
 512 52
 212808 457
 8112 114-1-12
 160 neat
 140
 208
 196
 12

lb L S P cwt gr lb
 112: 3-8 :: 114-1-12

lb
 19846
 1594 tare
 18252
 702 tret
 28)17550(4626
 168 156-2-22
 75 neat
 56
 190
 168
 22

11 Sold 177c. 22 lb
 gross tare 9 lb. per hun
 dred weight tret 11 lb. per
 104 lb required the neat
 weight and its amount at
 3l 11s. per hundred wei
 ght Ans neat 156c
 2 gr 22 lb amount 549l 15s
 6d 4

cwt lb
 177-22
 4
 708 26)18252(702
 28 182
 5666 52
 11418 52
 19846

112)178614(1594
 112
 666
 560
 1061
 1008
 534
 448
 86

lb L S P cwt gr lb
 112: 3-14 :: 156-2-22

Simple Interest

2 What is the interest of 87l
 11s 5d for one year at 6 perce
 nt per annum. Ans 5l 5s 3d

L S P
 87-11-5
 100)526-6-6
 500 5
 26 5
 1526 5
 500 5
 26 5
 12 5
 1318 3
 300 3

3 What is the amount of
 173l 17s 8 1/2 for a year at 7
 percent per annum. Ans

186l 15s 10 3/4 L S P
 173-17-8 1/2 173-17-8 1/2
 12-3-5 1/4 12-3-5 1/4
 186-1-13 1/4
 Ans
 100)1217-3-11 1/4
 100 122
 217 122
 200 122
 17 122
 20 122
 1360 3
 1360 3
 43 3
 1527 5
 200 5
 27 5
 110 1/4
 100 1/4
 10

$$\begin{array}{r} 100 \overline{) 883} \sim 8 \sim 9 \\ \underline{800} \\ 83 \\ \underline{80} \\ 3 \end{array}$$

$$\begin{array}{r} 79 \sim 10 \sim 2 \frac{1}{4} \\ 176 \sim 13 \sim 9 \\ \hline 256 \sim 3 \sim 11 \frac{3}{4} \sim 8ms \end{array}$$

$$\begin{array}{r} \sqrt{1668} (16) \\ \underline{160} \\ 668 \\ \underline{600} \\ 68 \\ \underline{64} \\ 12 \end{array}$$

$$\begin{array}{r} 7825 (82) \\ \underline{800} \\ 15 \\ \underline{10} \\ 5 \end{array}$$

iii Case 2.)))

Ans $\frac{3}{2} \frac{7}{2}$

$$\begin{array}{r} 1096-15-6 \\ 285-3-2 \frac{3}{4} \\ 1381-18-8 \frac{3}{4} \end{array}$$

Case 3

$$\begin{array}{r} 6 \\ 3 \overline{) 47} \quad 6 \overline{) 6} \\ \underline{20} \quad \underline{6} \\ 7 \quad 9 \overline{) 46} \\ \underline{12} \\ 6 \quad 5 \overline{) 52} \\ \underline{4} \\ 8 \quad 2 \overline{) 8} \end{array}$$

$$\begin{array}{r} 6 \\ 9 \overline{) 05.14} \\ \underline{20} \\ 14 \\ \underline{12} \\ 28 \\ \underline{24} \\ 4 \end{array}$$

$$\begin{array}{r} 63 \ 6 \\ \hline 5 \overline{) 69-11} \text{ W } 52:5-13-11\frac{1}{4}::16 \\ \underline{20} \\ 89 \\ 13 \overline{) 94} \\ \underline{71} \\ 23 \\ 211 \overline{) 28} \\ \underline{4} \\ 2 \end{array}$$

5 How much is the amount of 243
£ 145 for 146 days at $5\frac{1}{4}$ per cent.
Ans 249 £ 95 2d.

$\frac{3}{4}$ $\frac{1}{2}$ $\frac{1}{2}$
 $\frac{3}{4}$ $\frac{1}{2}$

$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

6 What is the interest of 71638
 11 days for 1 year 5 months and 25
 days at 6 per cent per annum.
 Ans 68 10 4/10

$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

7 What is the amount of a bond
 for 116 £ 17 s 2 d. for 6 years 7 months
 and 19 days at 7 per cent per annum
 Ans 171 £ 2 s 7 d.

$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

9 What sum will 674 £ 13 s 8 1/4 d
 amount to in 5 years 11 months
 and 28 days at 6 per cent per
 annum. Ans 917 £ 6 s 1 1/2 d

$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

10 What is the interest of
 517 dollars at 6 per cent per
 annum for 30 days at 6 per cent per
 annum Ans 2,58

$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

11 What is the interest of
 325 dollars at 6 per cent per
 annum for 64 days Ans 3,46

$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

12 At 6 per cent what
 will the interest be of 100 £
 from the 6th of the 7th
 month (July) to the 1st
 month of the 1st month (January)
 Ans 3 £ 15 s 9 1/2 d

$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

13 Tell the interest of 2410 £
 for 1 year and 135 days at 7
 per cent per annum Ans
 23 £ 0 s 30

$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

11 What is the interest of
371^l for 1 year and 213 days
at 6 per cent per annum
Ans 35^l 53^s 00

$$\begin{array}{r} 371 \\ \text{L} 22 \overline{) 250} \\ \text{S} 5 \overline{) 12} \\ \text{D} 2 \overline{) 4} \end{array}$$

$$\text{D} \text{P} 176 \text{D}$$

$$365 : 22-5-2\frac{1}{4} :: 365$$

15 What is the interest of a
bond for 325^l 15^s 6^d for 1 year
and 73 days at 7 per cent per
annum Ans 24^l 78^s 3^d 1/2

$$\begin{array}{r} 325-15-6 \\ \text{L} 22 \overline{) 80-8-6} \\ \text{S} 16 \overline{) 08} \\ \text{D} 1 \overline{) 02} \end{array}$$

$$365 : 22-16-1 :: 365$$

16 Required the interest of a
bond for 148^l 12^s 6^d 1/2 for 11
months at 6 per cent per annu
m Ans 8^l 38^s 3^d 3/4

$$\begin{array}{r} 148-12-6\frac{1}{2} \\ \text{L} 8 \overline{) 17-8-11\frac{3}{4}} \\ \text{S} 3 \overline{) 48} \\ \text{D} 5 \overline{) 87} \\ \text{P} 3 \overline{) 51} \end{array}$$

17 What sum will a bond of 333^l
13^s 3^d 1/4 amount to in 17 mon
ths at 6 per cent per annum
Ans 362^l 05^s 6^d 1/2

$$\begin{array}{r} 333-13-3\frac{1}{4} \\ \text{L} 28 \overline{) 36} \\ \text{S} 7 \overline{) 23} \\ \text{D} 2 \overline{) 77} \\ \text{P} 3 \overline{) 11} \end{array}$$

$$\begin{array}{r} 362-0-6\frac{1}{2} \text{ Ans} \\ \text{L} 28 \overline{) 36} \\ \text{S} 7 \overline{) 23} \\ \text{D} 2 \overline{) 77} \\ \text{P} 3 \overline{) 11} \end{array}$$

18 Father left a legacy to his dau
ghter of 651^l 11^s to be at interest
until she attained the age of eighteen
at his decease she was 15 years and
219 days old; what sum must she
call on her executor for interest
computed at 7 per cent per annum
Ans 761^l 08^s 2^d 1/2

$$\begin{array}{r} 651-11 \\ \text{L} 45 \overline{) 60-17} \\ \text{S} 12 \overline{) 17} \\ \text{D} 2 \overline{) 04} \\ \text{P} \text{L} \text{S} \text{D} \end{array}$$

19 What interest is due on a legacy
of 517^l 12^s 8^d 1/2 for 5 years 11 months
and 25 days at 6 per cent per annum
Ans 185^l 17^s 9^d 0

$$\begin{array}{r} 517-12-8\frac{1}{2} \\ \text{L} 18 \overline{) 517-12-8\frac{1}{2}} \\ \text{S} 18 \overline{) 312} \\ \text{D} 4 \overline{) 16} \end{array}$$

20 What is the interest of one farthing
for 579 1/2 years at 7 per cent per
annum Ans 85^s 5^d 1/4

Case 4

21. A owes B the following sums with the interest on the mat at 6 per cent per annum viz 60 £ . for 7 months; 150 £ for 15 months: 75 £ 10s for 9 months: 145 £ 15s. for 27 months and 399 £ 12s for 45 $\frac{1}{2}$ months: what is the amount of the principal and interest. Ques

955 Lc 145 6d 1/2 m Lc
 m 150
 227 Lc 2715 7 1/2
 3 1/2 60 3 1/2 10.50
 Vol 180 25
 30
 Lc 2 1/2 20
 3 2/00 No. 2 Lc 11 1/2 5
 200 5 5/00

$$\begin{array}{r} \text{m} \\ 29 \\ \hline 142 \end{array}$$

$$\begin{array}{r} \text{L} \text{O} \text{S} \\ 75 \cdot 10 \\ \hline 1342 \end{array}$$

$$\begin{array}{r} \text{L} \text{O} \text{S} \\ 302 \quad 0 \\ 37 \cdot 15 \\ \hline 339 \cdot 15 \\ 20 \\ \hline 3795 \\ 12 \\ \hline \text{No. 3} \quad 1140 \\ 11 \\ \hline 1160 \end{array}$$

$$\begin{array}{r} \text{m} \\ 27 \\ \hline 1342 \end{array}$$

$$\begin{array}{r} \text{L} \text{O} \text{S} \\ 145 \cdot 15 \times 1/2 \\ \hline 12 \\ 1749 \quad 0 \\ 145 \cdot 15 \\ \hline 72 \cdot 17 \cdot 6 \\ \hline 1967 \quad 12 \cdot 6 \\ 20 \\ \hline 1352 \\ 12 \\ \hline \text{No. 4} \quad 1630 \\ 12 \\ \hline 1720 \end{array}$$

$$\begin{array}{r} m \\ 224542 \\ \underline{22311} \\ 119216 \end{array}$$

$$\begin{array}{r} 8349 \cdot 12 \\ 397 \cdot 12 \\ 228 \cdot 14 \\ \hline 90/45 \cdot 8 \\ \hline 20 \\ 59/08 \\ 12 \\ \hline 96 \\ 4 \\ \hline 3/8 \cdot 11 \end{array}$$

$$\begin{array}{r} 2 \cdot 2 \cdot 0 \\ 11 \cdot 5 \\ 3 \cdot 7 \cdot 11 \frac{1}{4} \\ 19 \cdot 13 \cdot 6 \frac{1}{4} \\ 90 \cdot 9 \cdot 0 \frac{3}{4} \\ \hline 126 \cdot 17 \cdot 6 \frac{1}{4} \\ 828 \cdot 17 \cdot - \\ \hline 955 \cdot 14 \cdot 6 \frac{1}{4} \end{array}$$

Ans

2 What is the insurance of
an East India ship and cargo
valued at 1406 £ 175 60 at 15 3/4
per cent Ans 1166 £ 115 40 3/4

$\frac{3}{4} \frac{1}{2}$

L

$7406..14..6$

22220

$12..6$

$3x5$

5

$11103..2..6$

3703

89

1851

$111\frac{1}{2}$

$1166|58..5..7\frac{1}{2}$

20

L

$511|65$

12

$7|87$

14

$3|50$

3 Suppose $1\frac{1}{2}\%$ per cent be allo-
wed for commission: what mu-
st be demanded on 704615840.
Ans 12638d.

200122658d.
 13 1/2 1/2 1/2
 7011-15-11
 352 7-8
 176 3-10
 1233-6-10
 20
 5666
 12
 28702

11 What is the brokerage of 700 l.
145 6d. at 45. per cent. Ans

16850d $\frac{1}{4}$ L S D
L 7 $\frac{1}{2}$ - 14 - 6
 $\frac{12}{14}$
D 11 $\frac{1}{4}$
S 2/9 6 L S D
11 | $\frac{1}{5}$ | 7-0--1 $\frac{1}{2}$
1--8--0 $\frac{1}{4}$ Ans

5 What may a broker deem
and on 120 l 12 s 6 d at 6 s 4 d
per cent. Ans 1 l 6 s 7 d 1/4

Q 1/2 20 12-6

S 4 1/2 12

D 1 15 9

P 2 10 0

S 2 5 1/4

6-11 1 1/2

Q S 1

11-11-1 1/2

1 1 0 1/4

4 2 1/4

1 1 1/4

ans 1-6-7 1/4

6 The value of a ship and
cargo is 85600 dols what is
the insurance at 35 percent
Ans 29960 dols.

85600

35

428000

256800

Ans 2996000

Case 5

2 What sum at interest
for 9 years and 6 months at
1 1/2 per cent per annum wi
ll amount to 856 l 10 s?
Ans 600 l.

Q 1 1/2

9 1/2

40 1/2

2 1/4

42 3/4

100

142 3/4

571

Q 100 :: 856 1/2

342600

342600

342600

ans

Case 6

2 At what rate per cent will
600 dols. amount to 856 dols 50 cts
in 9 years and 6 months Ans
1 1/2 per cent.

Q 6

856.50

600

600 : 256.50 :: 100

100

1256.5000

4275

9 1/2

19.00

8550

7600

950

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

1900

2 In what time will 600 l amou
nt to 856 l 10 s at 1 1/2 per cent
per annum. Ans 9 y. 6 m.

Q 600

1 1/2

2400

300

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

2700

Q S

856-10

600

256.10

2700

5130

4860

2700

3240

3240

3240

3240

3240

3240

3240

3240

3240

3240

3240

3240

3240

3240

3240

3 A testator left his son besides
providing for his education &c.
2000 dols to receive the
amount thereof at 5 per cent
when he should arrive at
the age of 21 years which
his guardian then found to
be 2925 dols how old was
the boy

at his fathers decease.
Ans 11 years 9 months.

$$\begin{array}{r}
 \begin{array}{r}
 2000 \\
 10900 \\
 \hline
 2925 \\
 2000 \\
 \hline
 925
 \end{array}
 \begin{array}{r}
 y \\
 m \\
 \hline
 9 \cdot 3
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 21 \cdot 0 \\
 9 \cdot 3 \\
 \hline
 11 \cdot 9 \text{ Ans}
 \end{array}$$

1 What is the interest of
2466 16 56 for 10 months at
4 per cent per annum

$$\begin{array}{r}
 \begin{array}{r}
 2466 \cdot 16 \cdot 6 \\
 9867 \cdot 6 \cdot 0 \\
 98673 \cdot 0 \cdot 0 \\
 \hline
 \end{array}
 \begin{array}{r}
 1000 = 75 \cdot 0 \cdot 0 \\
 80 = 6 \cdot 13 \cdot 4 \\
 6 = 10 \cdot 0 \\
 \hline
 1 \cdot 2 \frac{1}{2}
 \end{array}
 \end{array}$$

82 - 4 - 6 1/2 ans

Rule

2 What is the interest of 2467 10 5 for 12 weeks at 5 per cent per annum.

$$\begin{array}{r}
 \begin{array}{r}
 2467 \cdot 10 \\
 12337 \cdot 10 \\
 148050 \cdot 0 \\
 \hline
 \end{array}
 \begin{array}{r}
 1000 = 19 \cdot 14 \cdot 7 \frac{1}{4} \\
 400 = 7 \cdot 13 \cdot 10 \\
 1 \cdot 10 \cdot 9 \frac{1}{4} \\
 \hline
 2 \frac{1}{2}
 \end{array}
 \end{array}$$

ans 28 - 9 - 5

3 What is the interest of 2467 10 5 for 50 days at 6 per cent per annum

$$\begin{array}{r}
 \begin{array}{r}
 2467 \cdot 10 \\
 14805 \cdot 0 \\
 148850 \cdot 0 \\
 744250 \cdot 0 \\
 \hline
 \end{array}
 \begin{array}{r}
 7000 = 19 \cdot 3 \cdot 63 \frac{1}{4} \\
 400 = 1 \cdot 1 \cdot 11 \\
 \hline
 20 \cdot 5 \cdot 7 \frac{1}{4}
 \end{array}
 \end{array}$$

ans

2 What will 400 l amount to in 4 years at 6 per cent per annum. Ans 504 l 19 3 7/4

2 What will 400 l amount to in 4 years at 6 per cent per annum

$$\begin{array}{r}
 \begin{array}{r}
 1st 5 \cdot 20 \\
 1 \cdot 1 \cdot 5 \\
 2d 5 \cdot 20 \\
 1 \cdot 1 \cdot 5 \\
 3d 5 \cdot 20 \\
 1 \cdot 1 \cdot 5 \\
 4d 5 \cdot 20 \\
 1 \cdot 1 \cdot 5
 \end{array}
 \begin{array}{r}
 400 \cdot 0 \cdot 0 \\
 20 \cdot 0 \cdot 0 \\
 424 \cdot 0 \cdot 0 \\
 21 \cdot 4 \cdot 0 \\
 4 \cdot 4 \cdot 9 \frac{1}{4} \\
 449 \cdot 8 \cdot 9 \frac{1}{2} \\
 22 \cdot 9 \cdot 5 \frac{1}{4} \\
 4 \cdot 1 \cdot 10 \frac{1}{2} \\
 476 \cdot 8 \cdot 1 \frac{1}{2} \\
 23 \cdot 16 \cdot 4 \frac{3}{4} \\
 4 \cdot 15 \cdot 3 \frac{1}{4} \\
 \hline
 504 \cdot 19 \cdot 9 \frac{3}{4} \text{ Ans}
 \end{array}
 \end{array}$$

3 how much is the compound interest of 1280 dols for six years at 5 per cent per annum *Ans* 1193.322 mills.

| | | | |
|---|----------------|-----------|------------|
| 5 | $\frac{1}{20}$ | 1280 | |
| | | 64 | |
| 5 | $\frac{1}{20}$ | 1344 | |
| | | 67.2 | |
| 5 | $\frac{1}{20}$ | 1411.2 | |
| | | 70.56 | |
| 5 | $\frac{1}{20}$ | 1481.76 | |
| | | 74.088 | |
| 5 | $\frac{1}{20}$ | 1555.848 | |
| | | 77.7924 | |
| 5 | $\frac{1}{20}$ | 1633.6404 | |
| | | 81.6822 | |
| | | 1715.3224 | |
| | | 1280 | |
| | | 1193.322 | <i>Ans</i> |

Rebate of
Amount

2 What is the present worth of 430 dols 67 cts. for 19 months discount at 5 per cent *Ans* 399.07 cts.

$$\begin{array}{ccc} 100 & P & 100 \\ 12 : 5 :: 19 \end{array}$$

$$\begin{array}{r} 195 \\ 7-91-6 \\ 100 \\ 107-91-6 \end{array}$$

$$\begin{array}{ccc} D.C.M. & P & D.C.M. \\ 107,91,6 : 100 :: 430,67,0 \end{array}$$

4 What will 500 l amount to in 11 years at 4 1/4 per cent per annum *Ans* 590 l 11 s 5 1/2 d

| | | | |
|-------|----|------|---------------------|
| 4 1/4 | 11 | 500 | 5 9 |
| | | 211 | 5 0 |
| 4 1/4 | 16 | 521 | 5 0 |
| | | 20 | 17 |
| 4 1/4 | 25 | 1 | 6 0 3/4 |
| | | 54.3 | 8 0 3/4 |
| 4 1/4 | 16 | 21 | 11 8 1/2 |
| | | 1 | 7 1/2 |
| 4 1/4 | 25 | 566 | 9 11 1/4 |
| | | 22 | 13 1 1/4 |
| 4 1/4 | 16 | 1 | 8 3 3/4 |
| | | 590 | 11 5 1/4 <i>Ans</i> |

5 What is the compound interest of 400 l 10 s at 3 1/2 per cent per annum for 3 years.

Ans 13 l 10 s 90 1/4 d

| | | | |
|-------|---|-------------|------------|
| 3 1/2 | 3 | 400 | 10 0 |
| | | 8 00 | 2 1/4 |
| 3 1/2 | 2 | 400 | 1 00 |
| | | 2 00 | 0 1/2 |
| 3 1/2 | 1 | 414 10 | 3 3/4 |
| | | 8 5 | 9 1/2 |
| 3 1/2 | 2 | 429 0 | 10 3/4 |
| | | 2 1 | 5 1/4 |
| 3 1/2 | 1 | 429 0 | 5 1/4 |
| | | 8 11 | 7 1/4 |
| 3 1/2 | 2 | 444 10 | 10 3/4 |
| | | 2 2 | 8 3/4 |
| 3 1/2 | 1 | 444 10 | 8 3/4 |
| | | 43 10 8 3/4 | <i>Ans</i> |

6 What is the rebate of 112 l 12 s. for 20 months at 7 per cent *Ans* 11 l 15 s 30 1/2 d

$$\begin{array}{ccc} 100 & L & 100 \\ 12 : 7 :: 20 \end{array}$$

$$\begin{array}{r} 12 \\ 11-13-11 \\ 100 \\ 111-13-11 : 100 :: 112-12 \end{array}$$

5 Sole goods for 832 dols one half to be paid at 3 months and the other half at 6 months: what must be discounted for present payment at 5 per cent Ans 15,28,5 mills.

15,28,5 mills.

m D m

12:5::3

12)12

1.25 D

100

12,25:100::

2832

416,000

416,000

11,000

101,25

88,7500

81,000

65,000

60,750

42,500

40,500

m D m

12:5::6

12)30

2,50 D

100

102,50:100::

2832

416,000

416,000

11,000

101,25

88,7500

81,000

65,000

60,750

42,500

40,500

De m

416,000

405,85,3

816,71,7

832

816,71,7

Ans 15,28,3

6 What is the present worth of 100 l. one half payable at 11 months and the other at 8 months; discount at 5 per cent Ans 97 l 11 s 4 d

m D m

12:5::6

12)30

2,50 D

100

102,50:100::

10

100

100

7 What difference is there between the interest of 500 dollars at 5 per cent. per annum for 12 years and the discount of the same sum at the same rate and for the same time Ans 112,50

500
2500
12
300
187,50

Ans 112,50

D y

1:5::12

12

60 D D

100

160:100::500

500

312,50

480

200

160

400

320

800

800

Equation

Equation

2 A merchant has owing to him 300 l to be paid as follows viz 50 l at 2 months 100 l at 5 months and the rest at 8 months but it is agreed to make one payment of the whole: when will that time be Ans at 6 months

50 x 2 = 100

100 x 5 = 500

150 x 8 = 1200

300 3)1800

Ans 6 months

3 It owes \$1000 dol of which 200 dol are to be paid present 400 dol at 5 months and the rest at 10 months but they agree to make one payment of the whole and wish to know the time *Ans* 6 months

$$\begin{array}{r} 200 \times = \\ 400 \times 5 = 2000 \\ 400 \times 10 = 4000 \\ 1000 \quad \underline{2600} \\ 6 \text{ months and} \end{array}$$

4 C owes a sum of money which is to be discharged viz $\frac{1}{2}$ at 2 months $\frac{1}{4}$ at 4 months $\frac{1}{8}$ at 6 months and $\frac{1}{8}$ at 8 months: but they agreeing to make one payment of the whole the equated time is required *Ans* 5 months

$$\begin{array}{r} 50 \times 2 = 100 \\ 50 \times 4 = 200 \\ 50 \times 8 = 400 \\ 50 \times 6 = 300 \\ 200 \quad \underline{2100} \\ 5 \text{ Ans} \end{array}$$

5 C is indebted to \$240 dol which by agreement is to be paid 5 months hence but C is willing to pay him 40 dol present provided he will give him longer time to pay the remainder which is agreed on: the time of payment is the before required *Ans* 6 months

$$\begin{array}{r} 240 \times 5 = 1200 \\ 40 \quad \underline{2120} \\ 6 \text{ months and} \end{array}$$

6 P owes \$1120 l which will be due 6 months hence but P is willing to pay him 60 l present provided he can have the remainder borne - longer time to which I agree: the time of payment is required *Ans* 7 months.

$$\begin{array}{r} 1120 \times 6 = 2520 \\ 60 \quad \underline{2520} \\ 360 \quad \underline{2520} \\ 7 \text{ months} \end{array}$$

P. Barter

2 What quantity of tea at 10s per lb. - sh be given for 1 cwt of chocolate at 4s per lb. *Ans*

$$\begin{array}{r} 11 \text{ lb } 12 \text{ oz} + \text{lb} \\ \text{lb } 3 \\ 1 : 4 :: 192 \\ 3 \text{ lb } 10 : 1 :: 748 \end{array}$$

3 How much rice at 28s per cwt. must be bartered for 3 1/2 of raisins at 50 per lb. *Ans* 50.39 7/8

$$\begin{array}{r} \text{lb } D \quad \text{cwt } 3 \\ 1 : 5 :: 3 - 2 \\ 11 \\ 112 \\ 28 \\ 392 \\ 5 \\ 28 : 1 :: 1960 \end{array}$$

4 A has linen cloth worth 200s and all ready money but in barter he will have 25cts B has broad cloth worth 2 dols per yard ready money: at what price ought the broad cloth to be rated in barter *Ans* 2.50 cts

$$\begin{array}{r} 6 \\ 20:25::100 \\ \hline 200 \\ 20)5000 \\ \hline 250 \text{ Ans} \end{array}$$

5. Suppose C has tea at 8.56¢ per lb. ready money but in barter he will have 10¢ per lb. I has tobacco worth 18¢ per lb. ready money how must he rate his tobacco per lb. to equal the tea in value? Ans 139¢

$$\begin{array}{r} 8.56:10::18 \\ \hline 102 \\ 1180 \text{ in } 9 \text{ Ans} \\ \hline 78 \\ 12 \\ 936 \\ 918 \end{array}$$

6. A has nutmegs worth 1 dol per po and ready money but in barter will have 106 cts per pound I has tobacco worth 10 cts. per lb. ready money: how must I rate his tobacco that his profits may be equivalent with A's. Ans 106 mills.

$$\begin{array}{r} 6 \quad 6 \quad 6 \\ 100:106::10 \\ \hline 1060 \text{ 106 mills} \\ \hline 690 \\ 600 \end{array}$$

7. A had 111 cwt. of iron at 30.5 per cwt for which B gave him 20 l in money and the rest in pork at 50 per lb. how much pork must be given besides the 20 l? Ans 1792 lb

$$\begin{array}{r} \text{cwt} \\ 111 \\ 30 \\ 20)1230 \\ \hline 6150 \\ \text{Doll } 20 \\ 5:1::4150 \\ \hline 830 \\ 579960 \\ \hline 1792 \text{ lb Ans} \end{array}$$

8. A has 320 dozens of candles at 120 cts per dozen for which B agrees to pay him 160 dols in cash and the rest in cotton at 20 cts per pound how much cotton must B give? Ans 1120 lb.

$$\begin{array}{r} 320 \\ 120 \\ \hline 6400 \\ 320 \\ \hline 98400 \\ \text{C } 160 \\ 20:1::22400 \\ \hline 122400 \\ \hline 1120 \text{ lb Ans} \end{array}$$

9. I has 75 sheep at 14.36¢ each for which I is to give him 14 l 12 s and the rest in Indian corn at 3.36¢ per bushel; how much corn must I give? Ans 210 bu 18 qt

$$\begin{array}{r} 14.36 \times 75 \\ \hline 2 \times 9 = 75 \\ 5160 \\ \hline 5240 \\ 236 \\ \hline 5476 \\ 1712 \\ \hline 36156 \\ \hline 3 \text{ D } 13 \text{ S } 6 \\ 3:6:1::36156 \end{array}$$

10. A and B bartered; A had 50 c. of sugar at 6d per pound which he gave to B for a quantity of cinnamon at 10.33¢ per pound how much cinnamon did B give? Ans 26 lb 10 oz.

$$\begin{array}{r} \text{cwt} \\ 50 \\ 6 \\ \hline 20 \\ 20 \\ \hline 160 \\ 10.33 \\ \hline 1666 \\ \hline 10:8::1666 \\ \hline 3360 \end{array}$$

11 B deliv^{er} 3 hogheads of brandy at 63 8d per gallon to C, for 128 yards of cloth: what was the cloth per yard

Ans 10 8 1/2 D 36

$$\begin{array}{r} 1 : 6-8 :: 3 \\ \hline 63 \\ 189 \\ 80 \end{array}$$

$$\begin{array}{r} \text{yds } 12 \overline{) 15120} \\ 126 \overline{) 1260} \quad (108 \text{ Ans} \\ \hline 1260 \end{array}$$

12 C has candles at 12 s. per dozen ready money but in barter he will have 13 s per dozen. P has cotton at 18c per pound ready money: what price must the cotton be at in barter and how much must be bartered for 100 dozen of candles? Ans the cotton at 19 1/2 p per pound and 800 lb must be given for 100 dozen candles.

$$\begin{array}{r} 12 : 13 :: 18 \\ \hline 12 \\ 144 \end{array}$$

$$\begin{array}{r} 144 \overline{) 234} \quad (1 \text{ 7/8} \text{ Ans} \\ \hline 144 \\ 90 \end{array}$$

$$\begin{array}{r} 1080 \overline{) 1008} \quad (7 \\ \hline 72 \end{array}$$

$$\begin{array}{r} 288 \overline{) 288} \quad (1 \\ \hline 288 \end{array}$$

$$\begin{array}{r} 1 \text{ 7/8} : 1 :: 1300 \\ \hline 15600 \end{array}$$

$$\begin{array}{r} 162400 \overline{) 62400} \quad (800 \text{ Ans} \\ \hline 62400 \end{array}$$

at 7d 1/2 per lb. ready money and will have of A 35 l in cash and the rest in linen: at what rate is the sugar in barter and how much linen must A give B Ans the sugar 9d and 18 6 1/2 ells.

$$\begin{array}{r} 10 : 1 :: 7 1/2 \\ \hline 40 \quad 12 \quad 30 \end{array}$$

$$\begin{array}{r} 40 \overline{) 360} \\ \hline 9 \text{ Ans} \end{array}$$

$$\begin{array}{r} 3610 \\ 7 1/2 \end{array}$$

$$\begin{array}{r} 25270 \\ 1805 \end{array}$$

$$\begin{array}{r} 12 \overline{) 27075} \\ \hline 2256 \end{array}$$

$$\begin{array}{r} 2256 \cdot 3 \\ \hline 112 \cdot 16 \cdot 3 \end{array}$$

$$\begin{array}{r} 10 : 1 :: 7 1/2 \cdot 16 \cdot 3 \\ \hline 1556 \end{array}$$

$$\begin{array}{r} 10 \overline{) 18615} \\ \hline 1861 1/2 \text{ Ans} \end{array}$$

14 Two merchants barter: A receives 20 cwt. of cheese at 21 s 6d per cwt B 8 pieces of linen at 36 1/4 s per piece which of them must receive money and how much Ans A 8 l 2 s

$$\begin{array}{r} 21 \cdot 6 \\ \hline 14 \cdot 520 \end{array}$$

$$\begin{array}{r} 460 \overline{) 21000} \\ \hline 21000 \end{array}$$

$$\begin{array}{r} 36 \cdot 1/4 \\ \hline 29 \cdot 12 \end{array}$$

$$\begin{array}{r} 21 \cdot 10 \\ \hline 8 \cdot 2 \end{array}$$

$$\begin{array}{r} 21 \cdot 10 \\ \hline 8 \cdot 2 \end{array} \text{ Ans}$$

15 If 24 yards of cloth be given for 5 cwt. of tobacco at 18 s per cwt what is the cloth rated at per yard Ans 8 s 3d 3/4

13 A has linen at 100 the ell ready money but in barter B has 3610 lb of sugar

$$\begin{array}{r} 26 \\ 4 \overline{) 798} \\ \underline{199} \quad 6 \\ 12 \end{array} \quad (12)$$

$$\begin{array}{r} 24 \overline{) 2344} \quad \left(\begin{array}{l} 99 \\ 8 = 3\frac{3}{4} \end{array} \right) \text{ Ans} \\ \underline{216} \\ 234 \\ \underline{216} \\ 184 \\ \underline{172} \quad \left(\frac{3}{4} \right) \end{array}$$

$$\begin{array}{r} 1614850 \\ 89 \\ 7-4 \\ \hline 5 \times 8 = 40 \\ 1-16-8 \\ 8 \\ \hline 14-13-4 \end{array}$$

$$\begin{array}{r}
 \text{L} \\
 \text{Ch Dewt} \\
 1:8:7:2 \\
 \hline
 14 \\
 36 \\
 28 \\
 \hline
 240 \\
 60 \\
 \hline
 840 \text{ and} \\
 8
 \end{array}$$

$$\begin{array}{r}
 1400 \overline{) 6720} \left(4\frac{3}{4} \right. \\
 \underline{5600} \\
 1120 \\
 \underline{1120} \\
 0
 \end{array}$$

$$\begin{array}{r}
 1480 \left(3 \right.
 \end{array}$$

cwt L cwt
 1 : 3 :: 20
 60 lb 3
 8 : 1 :: 60

$\begin{array}{r} 17-6 \\ \underline{10} \\ 7-6 : 10 :: 10 \\ \underline{12} \\ 39 \end{array}$

[illegible]

Loss and Gain

2 Bought knives for 20 cts each and sold them at 17 cts each: how much is lost by the sale of 120 dozen? Ans 113,20 cts.

$$\begin{array}{r} \text{knife } 20 \\ 1 : -17 :: 120 \\ \hline 1440 \\ 3 \\ \hline \text{Ans } 4320 \end{array}$$

3 Hats bought at 48 a piece and sold at 45 7/8. what is the gain per cent? Ans 18 1/8.

$$\begin{array}{r} \$ 48 \\ 11 \cdot 9 \\ 4 : 9 :: 100 \\ \hline 200 \\ 11/18 \cdot 000 \\ 12/11 \cdot 500 \\ 20/375 \\ \hline 18 \cdot 15 \text{ Ans } 18 \cdot 15 \end{array}$$

4 Bought 7 tuns of wine at 17 l per tun and sold it at 18 p per pint what is the whole gain and the gain per cent? Ans whole gain 229 l 12 s per cent 118 l 11 s 8 d 4/5.

$$\begin{array}{r} \text{7 tuns} \\ 17 \cdot 00 \\ 17 \cdot 00 \\ \hline 119 \cdot 00 \\ 196 \cdot 00 \\ \hline 215 \cdot 00 \\ 475 \cdot 00 \\ \hline 20/141 \cdot 12 \\ 705 \cdot 12 \\ 476 \cdot 00 \\ \hline 229 \cdot 12 \text{ Ans} \end{array}$$

$$\begin{array}{r} \text{hhd take} \\ 17 \\ 17 \end{array}$$

$$\begin{array}{r} 20/500 \\ 25 \cdot 00 \\ \hline 17/16400 \\ 1530 \\ \hline 10280 \\ 68 \\ \hline 11448 \end{array}$$

5 A draper bought 100 yards of cloth for 119 dols how must he sell it per yard to gain 51 dols in the whole? Ans 2 dols per yard.

$$\begin{array}{r} 100/5100 \\ 5100 \\ \hline 119 \\ 119 \\ \hline 11900 \\ 11900 \\ \hline 90 \\ 90 \end{array}$$

6 Bought 60 reams of paper at 2 dols per ream what is lost in the whole quantity at 11 per cent. Ans 4,80 cts reams.

$$\begin{array}{r} 60 \\ 2 \\ \hline 120 \\ 120 \\ \hline 1180 \text{ Ans} \end{array}$$

7 Sold 500 penknives at 150 a piece and 9 per cent lost what is lost in the whole number Ans 3 l 18 s 9 d 3/4.

$$\begin{array}{r} 500 \\ 15 \\ 12 \overline{) 7500} \\ 2 \overline{) 625} \\ 91 : 9 :: 31-5 \\ 20 \\ 1820 \end{array}$$

$$\begin{array}{r} 5625 \\ 5460 \\ 1650 \\ 3300 \\ 1820 \\ 1480 \\ 117760 \\ 16380 \\ 1380 \\ 5520 \end{array}$$

8 Paid 69l. for 1 ton of steel what is the profit or loss on the sale of 14 tons retailed at 6d. per pound Ans 182l. loss.

$$\begin{array}{r} 69 \\ 14 \\ 276 \\ 69 \\ 966 \\ 784 \\ 182 \end{array}$$

$$\begin{array}{r} 14 \\ 20 \\ 280 \\ 4 \\ 1120 \\ 28 \\ 8960 \\ 2240 \\ 12 \overline{) 188160} \\ 2 \overline{) 15680} \\ 784 \end{array}$$

9 Off a yard of cloth be bought for 13s 4d and sold for 16s. what is the gain per cent? Ans 20l

$$\begin{array}{r} 13-4 : 16-0 :: 100 \\ 12 \\ 160 \end{array}$$

$$\begin{array}{r} 12 \\ 32 \\ 2000 \\ 12 \\ 24000 \\ 48000 \\ 72000 \\ 768000 \\ 640 \\ 1280 \\ 1280 \end{array}$$

10 If 1c. of tobacco be bought for 4l 13s 4d. and sold at 11d per pound what is the gain or loss per cent and 10 l gain.

$$\begin{array}{r} 112 \\ 11 \\ 12 \overline{) 1232} \\ 2 \overline{) 102-8} \\ 5-2-8 \\ 11-13-4 \\ 4-13-4 : 9-4 :: 100 \\ 20 \\ 2000 \\ 112 \\ 24000 \\ 48000 \\ 24000 \\ 24000 \\ 268800 \\ 2240 \\ 11480 \\ 114800 \end{array}$$

11 A draper bought 100 yards of cloth for 56l. how must he sell it per yard to gain 15l. per cent Ans 12s 10d 1/2

$$\begin{array}{r} 56 \\ 10 \\ 5 \overline{) 10} \\ 2 \\ 100 : 61-8 :: 1 \\ 20 \\ 512 \overline{) 88} \\ 12 \\ 12-10 1/2 \\ 10 \overline{) 56} \\ 11 \\ 5 \overline{) 24} \end{array}$$

12 Sold 12 yards of cloth for 5l 11s by which was gained percent what was the prime cost of a yard Ans 8s 9d 1/2 +

$$\begin{array}{r} 5-11 \\ 4 \overline{) 25} \\ 4 \overline{) 25} \\ 5-11 \\ 5-11 \\ 5-11 \\ 12 \overline{) 104} \\ 8 \\ 11 \overline{) 36} \\ 3 \\ 8 \end{array}$$

24

$$\begin{array}{r} 10 \\ \underline{100} \\ 110 : 100 :: 4 \end{array}$$

$\sqrt{480} \approx 21.9$

$$\begin{array}{r} 12 \\ 76 \\ \hline 11 \end{array} \quad \begin{array}{r} 12 \\ 25 \\ \hline 11 \end{array} \quad \begin{array}{r} 100 \\ 20 \\ \hline 2000 \end{array}$$
$$\begin{array}{r} 264000 \\ 282 \\ \hline 598000 \end{array}$$

$\frac{840}{7} = 120$

bought a chest of tea w

20
25
18

18. $\frac{100}{100} 116 \text{ f}$

108
12
20
40 138

612
172
72

4520. per lb. ready money and

was gained on the whole all

and how much percent per annum? (12-1-18)

300 also 300
20000 5000

12-40 62-10
in m

$$\frac{100}{104} : 100 :: 75 = 72 \frac{1}{2}$$

62.102 L^o S^o 1700

14400

15 If when cloth is sold at
75 per yard to

ing 490 lb for 326 dols and sold
it for 290 dols and 100 lb of

$\frac{1}{2}$ 8
 37010
 325

for 66 108. per piece paid 20s 10d
a piece for drying: for 4

20 percent? Ans 96 1/3.

| | | | |
|----|---|----|----|
| 20 | 7 | 10 | 10 |
| 5 | 1 | 10 | 2 |

Ans

18 If 28 pieces of stuff be purch

what rate must the rest be disposed of to gain 30% on the whole?

1874

$$\begin{array}{r} SP \\ 6 \cdot 14 \frac{4}{11} : \frac{6 \cdot 14 \frac{4}{11}}{6} :: 100 \\ \frac{12}{76} \\ \frac{11}{840} \end{array}$$

$$\begin{array}{r} 20 \\ 2000 \\ 12 \\ 24000 \\ 11 \\ 264000 \\ 118 \\ 2112000 \\ 1056000 \end{array}$$

$$\begin{array}{r} 840 \overline{) 12672000} \\ \underline{84} \\ 427 \\ \underline{420} \\ 720 \\ \underline{672} \\ 480 \\ \underline{420} \\ 60 = 5 \\ 12 \overline{) 84} = 7 \end{array}$$

$$\begin{array}{r} 15085 \frac{5}{4} \\ (12) \overline{) 1371 \frac{33}{7} - 3} \\ 77 - 7 \\ (20) \overline{) 114 - 3} \\ 5 \cdot 14 \cdot 3 \frac{3}{7} \end{array}$$

ans

19. Sold a yard of cloth for 11s 6d. by which was gained at the rate of 15 per cent. but if it had been sold for 12s what would have been the gain per cent?
Ans 20%.

$$\begin{array}{r} 15 \\ 100 \\ \hline 115 : 100 = 11.6 \\ 12 \\ \hline 1380 \end{array}$$

$$\begin{array}{r} 138 \\ \underline{100} \\ 1380 \\ \underline{1380} \\ 0 \end{array}$$

(10 original)

$$\begin{array}{r}
 10 : \frac{3}{12} :: 100 \\
 \frac{10}{2} :: 100 \\
 \hline
 200 \\
 2009 \\
 \hline
 40 \overline{) 4000} \\
 \underline{2000} \\
 2000 \\
 \underline{2000} \\
 2000 \text{ Ans}
 \end{array}$$

21. At 10% per shilling prof
it how much percent?

Ans 12 1/2
 1: 1/2 :: 100
 20

$$\begin{array}{r} 20 \\ \hline 2000 \\ \hline 11 \overline{) 2000} \\ 12 \overline{) 3000} \\ 20 \overline{) 250} \\ \hline 12 \dots 10 \end{array} \quad \text{Ans}$$

22. At 35.6 c. in the pound
profit how much per cent

Ans 17 405
 1:3:6::100

$$\begin{array}{r} 12 \\ 112 \\ 100 \\ 1211200 \\ 251350 \\ 17-10 \end{array}$$
 Apr 2

20 If when cloth is sold at 7s.
a yard the gain is 10l. 6s. a yard?
Ans 5l 14s 3d $\frac{3}{4}$ lost.

$$\begin{array}{r} L \\ 10 \\ \hline 100 \\ \hline 110 : 100 :: 7 \\ 20 \quad 20 \quad 2000 \\ \hline 2200 \quad 2000 \quad 14000 \\ 2200 \quad 1320 \\ \hline 8 \\ 12 \\ \hline 196 (40 \\ 88 \\ \hline 2) \frac{8}{22} = \frac{4}{11} \end{array}$$

23 If by selling 1 lb. of pep
per for 10d $\frac{1}{2}$ there is 2d. lost,
how much is the loss per cent?

Ans 166.

| | |
|--|---|
| $\begin{array}{r} 12\frac{1}{2} : 2 :: 100 \\ \hline 50 \end{array}$ | $\begin{array}{r} 200 \\ \hline 2000 \\ 12 \end{array}$ |
|--|---|

$$\begin{array}{r}
 24000 \\
 96000 \\
 \hline
 501192000 \\
 1213840 \\
 \hline
 201320 \\
 16
 \end{array}$$
 Ans

21. A merchant received from Lisbon 180 casks of raisins which stand him here in 16s each; and by selling them at 28s per Cwt he gains 25 per cent required the weight of each cask one with another? Ans 80 lb.

$$\begin{array}{r} \text{casks} \\ 180 \\ 16 \\ \hline 1080 \\ 180 \\ \hline 20 \overline{) 2880} \\ 144 \\ \hline 25 \\ \hline 720 \\ 288 \\ \hline 3600 \\ \text{Interest } 288 \\ \hline 3600 \end{array}$$

$$\begin{array}{r} 144 \\ 36 \\ \hline 180 \end{array}$$

$$\begin{array}{r} \text{cwt} \\ 128 \cdot 2 \cdot 8 \\ \hline 514 \\ 28 \\ \hline 4120 \\ 1028 \\ \hline 180 \overline{) 14400} \\ 1440 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 28 \overline{) 3600} \\ 28 \\ \hline 80 \\ 240 \\ 224 \\ \hline 16 \\ 4 \\ \hline 7611 \end{array}$$

$$\begin{array}{r} 28 \\ 224 \\ \hline 224 \end{array}$$

Fellowship 1823

11 put in stock 1800 dols B advanced 11 months after required the sum he put in so as at the years end to claim equal profits with A? Ans 2700 dols

$$\begin{array}{r} m \\ 12 \\ \hline 8 \cdot 1800 :: 12 \\ \hline 8 \overline{) 21600} \\ \text{Ans } 2700 \end{array}$$

5. A, B, and C join stocks for 12 months; A puts in 100l and the first of the fifth month 150l more and on the first of the ninth month takes out 30l B puts in 250l on the first of the sixth month 60l more and on the first of the eleventh month 100l more C puts in 300l on the first of the fourth month takes out 200l and on the first of the eighth month takes out 50l more the whole gain is 133l what is each of it? Ans A must have 100l B 128 6d C 27l 13s 5d.

$$\begin{array}{r} \text{£} \\ 100 \\ 12 \\ \hline 1200 \\ 1200 = 150 \times 8 \\ \hline 2400 \\ 120 \quad 30 \times 4 \\ \hline \text{A } 2280 \\ 3620 \\ \hline 1550 \end{array}$$

$$\begin{array}{r} \text{£} \\ 250 \\ 12 \\ \hline 3000 \\ 1120 \quad 60 \times 7 \\ \hline 200 \quad 100 \times 2 \\ \hline \text{B } 3620 \end{array}$$

$$\begin{array}{r} \text{£} \\ 300 \\ 12 \\ \hline 3600 \\ 1800 \quad 200 \times 9 \\ \hline 1800 \\ 250 \quad 50 \times 5 \\ \hline \text{C } 1550 \end{array}$$

$$\text{As } 7450 : 133 :: 2280$$

$$\begin{array}{r} 133 \\ \hline 6840 \\ 6840 \\ \hline 2280 \\ 7450 \overline{) 303240} \\ \underline{2980} \\ 5240 \\ \underline{110480} \\ 7450 \\ \underline{3030} \\ 2980 \\ \underline{520} \\ 6000 \\ \underline{12100} \end{array}$$

$$\text{Ans } 110 \dots 11 \dots 0 \frac{3}{4} \text{ Ans}$$

6 A, B, and C made a stock for 12 months; A put in at first 364l. and four months after he put in 100l. more; B put in at first 408l. and at the end of 7 months he took out 86l. C put in at first 148l. and three months after he put in 86l. and 5 months after that he put in 100l. more; and at the end of 12 months their gain is found to be 1436l. what is each man's share thereof? Ans A 556l. 3s 6d 1/2. B 529l. 16s 9d 1/4. C 349l. 19s 8d.

$$\begin{array}{r} \text{£} \\ 364 \\ 12 \\ \hline 4368 \\ 320 \quad 40 \times 8 \\ \hline \text{A } 4688 \\ 4466 \\ \hline 2950 \end{array}$$

$$\begin{array}{r} \text{£} \\ 408 \\ 12 \\ \hline 4896 \\ 430 \quad 80 \times 5 \\ \hline \text{B } 4466 \end{array}$$

$$\begin{array}{r} \text{£} \\ 148 \\ 12 \\ \hline 1776 \\ 774 \quad 80 \times 9 \\ \hline 400 \quad 100 \times 4 \\ \hline 2950 \end{array}$$

$$12104 : 1436 :: 4688$$

$$\begin{array}{r} 11488 \\ 11488 \\ \hline 9616 \\ 5744 \\ 12104 \overline{) 6731968} \\ \underline{60520} \\ 67996 \\ \underline{60520} \\ 74768 \\ \underline{72624} \\ 2144 \\ \underline{142880} \quad 3 \text{ s} \\ 36312 \\ \underline{6568} \\ 178816 \quad 6 \text{ d} \\ \underline{72624} \\ 6192 \\ \underline{1214768} \quad 2 \text{ f} \end{array}$$

L

$$\begin{array}{r} 1156 \\ 3 \\ \hline 1368 \\ 600 \\ \hline 768 \\ \hline \hline 431 \\ 3 \\ \hline 1293 \\ 768 \\ \hline 525 \end{array}$$

$$\begin{array}{r} 600 \\ 378600 \\ \hline 3786 \\ \hline 600 \end{array}$$
 200 A. Shave

$$1893:631::525=17.5 \text{ C Share}$$


Exchange.

2 What is the value of a bill of 750 l. Pennsylvania or or the like currency, in New York or North Carolina currency? Ans 800 l.

$$\begin{array}{r} \text{S D S} \\ 7-6:8::750:800, \text{ Ans} \end{array}$$

3 What sum of New York currency is equal to 173 l 16 s. in New Jersey? Ans 185 l 7 s. 8 d 3/4

$$\begin{array}{r} \text{S D S} \\ 7-6:8::173-16 \end{array}$$

4 Exchange for 375 l. Pennsylvania currency. Thirty days after sight pay to Charles Mack sen or order three hundred seventy-five pounds Pennsylvania currency as per advice from they friend Peter Simpson to Benjamin Brown Merchant Virginia.

How much Virginia currency will discharge the above bill Ans 300 l

$$\begin{array}{r} \text{S D S} \\ 7-6:6::375 \end{array}$$

$$\begin{array}{r} 7500 \\ 12 \\ \hline 90000 \\ 9054000 \\ \hline 2076000 \text{ Ans} \\ 300 \end{array}$$

5 B. of Massachusetts received in Pennsylvania currency the following sums viz 76 l 17 s 8 d 200 l and 170 l 10 s 11 d what sum is equal thereto in the state he resides in? Ans 357 l 18 s 10 d 1/2.

$$\begin{array}{r} \text{S D S} \\ 76-17-8 \\ 200 \\ 170-10-11 \\ \hline 7-6:6::447-8-7 \end{array}$$

6 How much South Carol in currency is equal to 1500 l of New Jersey? Ans 933 l 6 s 8 d. S D S D L D 7-6:11-8::1500

7 A merchant in New York owes 240 l to a planter in Virginia; how much ought he to be charged with in the planter's books Ans 180 l.

$$\begin{array}{r} \text{S S} \\ 8:6::240 \end{array}$$

8 Exchange for 562 l 13 s 9 d.

Twelve days after sight please to pay to David Davis or order five hundred and sixty-two pounds thirteen shillings and eight pence value received; and place the same to account as per advice from they friend Isaac Jones.

To Bradshaw Watson, what sum Georgia currency will discharge this bill. Ans 398 l 4 s 7 d 1/2

$$\begin{array}{r} \text{S S D} \\ 8:11-8::562-13-9 \end{array}$$

9 C of Connecticut draws on D of Delaware for 1011 l 16 s 9 d. what sum in the latter currency will pay this draught? Ans 131 l 0 s 11 d 1/4

$$\begin{array}{r} \text{S S D} \\ 6:7-6::1011-16-9 \end{array}$$

10 What sum New-York currency is equal to 180 l in Massachusetts? Ans 240 l.

$$\begin{array}{r} \text{S S} \\ 6:8::180 \end{array}$$

11 How much South Carolina currency is equal to 360 l. Massachusetts money
 Ans 280 l. S S D
 $6: 11-8 :: 360$

Case 2

999
999
999

12 A Bill of exchange for 1175 l. being remitted from Georgia to New-jersey; what is the value of it in Jersey currency? Ans

763 l. 78 100. $\frac{1}{4}$ l.
 S D S D
 $11-8: 7-6 :: 1175$

3 Jamaica is indebted to Lond on 11470 l. 12 s 8 d. sterling with how much currency will Lond on be credited at Jamaica when the exchange is at 36 $\frac{1}{2}$ per cent? Ans 2007 l. 8 s 3 d. $\frac{3}{4}$

| | |
|---------------|-----------------------|
| 25 | 11470-12-8 |
| 10 | 367 13 2 |
| 1 | 147 1 3 |
| $\frac{1}{2}$ | 14 14 1 $\frac{1}{4}$ |
| $\frac{1}{4}$ | 7 7 0 $\frac{1}{2}$ |

2007. 8. 2 $\frac{3}{4}$ Ans

13 If 1172 l. 16 s 8 d. be trans mitted from Georgia to North carolina; what sum is it equ al to in the latter state

Ans 810 l. 11 s 5 d. $\frac{1}{4}$
 S S S D
 $11-8: 8 :: 1172-16-8$

14 Dublin draws upon London for 740 l. 11 s 6 d. Irish exchange at 12 per cent. how much sterling will discharge this ~~change at 12 per cent~~ ~~how much sterling will discharge this bill?~~ Ans 661 l. 7 s 2 d. $\frac{3}{4}$

$\frac{12}{100}$ L L S D
 $112: 100 :: 740-11-6$

14 How much Virginia curren cy will purchase a bill for 280 l. South Carolina curren cy? Ans 360 l.
 S D S D
 $11-8: 6 :: 280$

5 London remits to Ireland 651 l. 11 s 11 d. $\frac{3}{4}$ sterling? how much Irish must London be credited exchange at 12 per cent? Ans 729 l. 19 s 2 d.

$\frac{12}{100}$ L S D
 $100: 112 :: 651-11-11 \frac{3}{4}$

| | |
|-----|--------|
| 20 | 2000 |
| 12 | 24000 |
| 112 | 96000 |
| 20 | 13034 |
| 12 | 156419 |
| 112 | 625679 |

1251358

625679

625679

70076048

6720004

287604

192000

956048

864000

92048

11840960

L S D
 729-19-2

15 What is 96 l. 16 s 9 d. $\frac{3}{4}$ of Charleston, South Carolina worth in New-york? Ans 166 l. 0 s 3 d. $\frac{3}{4}$
 S S D
 $11-8: 8 :: 96-16-9 \frac{3}{4}$

16 Reduce 36791 l. 11 s 4 d. of New-york to New-jersey currency. Ans 34497 l. 4 s 8 d. $\frac{1}{4}$
 S S D S D
 $8: 7-6 :: 36791-11-4$

6 Exchange for 452 l 10 s 6 d. ster-
ling. Thirty days after sight of this
my first of exchange second and
third of like tenor and date not
paid pay to Samuel Sims or ord-
er for hundred fifty-two pounds
ten shillings and six pence ster-
ling value received; and place
the same to account as per ad-
vice from Peter Simpson

Samuel Pimm, Merchant, London

What is the value of this bill in
Pennsylvania currency exch-
ange at 77 1/2 per cent? Ans

$$\begin{array}{r} 80345 \text{ rd} \\ 77 \cdot 10 \\ \hline 100 : 177 \cdot 10 :: 452 \cdot 10 \cdot 6 \end{array}$$

7 In a settlement between C
of Philadelphia and D of Lon-
don C is indebted 750 l 2 s 4 d 1/2
sterling; what sum Pennsyl-
vania currency is equivalent
exchange at 78 per cent? Ans

$$\begin{array}{r} 1335 \text{ l } 4 \text{ s } 2 \text{ d } 1/2 \\ 78 \\ \hline 100 : 178 :: 750 \cdot 2 \cdot 4 \cdot 1/2 \end{array}$$

8 How much sterling is equal to
1341 l 9 s 4 d 3/4 Pennsylvania cur-
rency exchange at 67 1/2 per cent? Ans

$$\begin{array}{r} 800 \text{ l } 17 \text{ s } 6 \text{ d } 1/2 \\ 67 \cdot 10 \\ \hline 100 : 167 \cdot 10 :: 1341 \cdot 9 \cdot 4 \cdot 3/4 \end{array}$$

9 What sum sterling will be eq-
ual to 260 l 8 s 6 d. Virginia cur-
rency exchange at 44 per cent? Ans

$$\begin{array}{r} 180 \text{ l } 17 \text{ s} \\ 44 \\ \hline 100 : 144 :: 260 \cdot 8 \cdot 6 \end{array}$$

10 Purchased in Ireland
effects to the value of 1100
17 s 9 d. of that place; what
sum, Pennsylvania cur-
rency will discharge the
debt exchange at 51 1/2 per
cent? Ans

$$\begin{array}{r} 607 \text{ l } 6 \text{ s } 10 \text{ d } 1/2 \\ 51 \cdot 10 \\ \hline 100 : 151 \cdot 10 :: 1100 \cdot 17 \cdot 9 \end{array}$$

11 Exchange for 4876 livres
12 sols 8 deniers. Thirty days
after sight of this my second
of exchange first of the
same tenor and date not paid, pay
to Thomas Brooke or order four
thousand two hundred and two
twenty six livres twelve sols and
eight deniers value received

; and place the same to
account, as per advice from
Silas Stroud To Thomas
Lamott, Merchant London
How much sterling is the
above bill at 100 1/2 per livre?
and what sum in Pennsylva-
nia currency, at 170 1/2 per
livre?

$$\begin{array}{r} 184 \cdot 18 \text{ } 3/4 \text{ sterling} \\ \text{and } 308 \text{ } 3 \text{ } 10 \text{ currency} \\ \text{livres } 9 \text{ } \text{livres } 10 \text{ } \text{deniers} \\ 1 : 10 \cdot 1/2 :: 4876 \cdot 12 \cdot 8 \\ \hline 20 \text{ } 11 \\ 7 \cdot 12 \cdot 42 \quad 84532 \\ \hline 240 \quad 1014392 \end{array}$$

$$\begin{array}{r} 2028784 \\ 4057568 \\ \hline 240 \text{ } 4260446 \text{ } 1/2 \\ \hline 1860 \\ 1680 \\ \hline 1804 \\ 1680 \end{array}$$

Ans

12 A Connecticut merchant imported goods from France amounting per invoice to 49008 livres; how much currency of that state at 15d per livre, will they amount to: and how much sterling will discharge the debt exchange being at par?

Ans 3083 0 0 currency
 2297 5 0 Sterling.
 Liver D Liver
 1: 15 :: 49008
 245040
 49008
 12) 735120
 8) 2961260
 1-4: 1 :: 3063-0-0 currency
 20
 61260
 12
 16) 735120
 20) 45945
 2297-5 Sterling

13 A merchant in Holland being desirous to turn 4376 florins currency into lances, the agio is at 4 per cent. how many pounds Flemish banco must he receive? Ans 701 l. 1 fl. 13 sti. 13 pen.

104: 100 :: 4376
 437600
 416
 216
 208
 800
 728
 72
 120
 1144013
 104
 400
 312
 88
 528
 88
 1140813
 1352

14 B. of Philadel Philadelphia receives of A of Amsterdam an invoice of goods amounting to 10235 flo. 14 sti. 8 pen. how much pennsylvania currency must be remitted to discharge the bill at 35d per florin? And what is the sum in sterling exchange at 3836d.

flemish per L sterling?
 Ans 1503-7-10 1/2 currency
 886 4 3/4 Sterling.
 flo D flo sti pen
 1: 35 1/4 :: 10235-14-8
 20
 20
 16 1/4 204717
 120
 20
 320 1228310
 204717
 3275480
 111
 3275480
 13101920
 3275480
 320) 461842680
 32
 141
 128
 138
 128
 104
 96
 82
 64
 186
 160
 268
 256
 1143258
 360814-1/2
 2930067-10
 1503-7-10 1/2
 Currency

L D L flo sti pen
 33-6: 1 :: 10235-14-8
 12
 462
 3696
 204717
 16
 1228310
 204717
 3275480
 29568
 31868
 29568
 23000
 22176
 824
 20
 116480
 14784
 1696
 12
 20352
 18480
 1872
 11
 17488
 1392
 2

15 A bill for 2544 pesos, 7 via
33 marv being remitted to Cadix;
what sum Pennsylvania cur-
rency is equal thereto at 456d.

per peso? Ans 946 17 3/4
pero S D pesos via marv
1: 7-6 :: 2524-7-33
8 12
34 90 20199
272 34
80799
60600 (12)
6867990
272) 61811910 227249 1/2
(20) 18937-5 1/2
946-17-5 1/2
Ans

16 A Virginia merchant sent
goods to ~~London~~ Norway worth
1743 £ 16s Virginia currency: how
many rice dollars at 6s each must
he receive? Ans 5812 dols. U.S.

S rice dol L
6: 1 :: 1743-16
20
6) 34876
5812-4 Ans

17 A merchant of North Carolina
shipped a quantity of flour which when
disposed of amounted to 1186 millreas
500 reas; and received in return 17
pipes of wine; what was it per pipe a
millrea reckoned at 456d. Ans 26 £

385d 1/4 millrea S D mill reas
1: 7-6 :: 1186-500
1000 12 1000
1000 90 1186500
12) 106785000
22) 8898-9
Pipes 17) 444-18-9
34 (26 £
104
162
20
14) 58 (35
51
72
17) 93 (5 P
35
84
32 1/4

18 In 2714 guilders 15 stiv-
ers, how many pounds ster-
ling; exchange at 35s 6d fl
emish per £ sterling?

Ans 254 £ 18s 10d
S D L quil Sti
35-6 : 1 :: 2714-15
12 20
426 54295
108590 (254 £
852
2339
2130
2090
1704
386
20
7720 (18s
426
3460
3408
52
562 1/2 P

19 In 290 £ 11s 10d sterling
how many pounds flemish
exchange at 33s 10d flemish
per £ sterling and agio at 1 1/2
percent Ans 513 £ 14s 10d.

L S D L S D
1: 33-10 :: 290-11-10
20 12 20
20 406 5811
12 12
240 69742
406
418452 (12)
2789680
240) 28875252 (117980
240
431 (20) 9831-8
491-11-8
1966-6-8
245-15-10
L S D L S D
491-11-8 22) 12-2-6
22 2 5 20
513-14-1 ans 5710
P 5710